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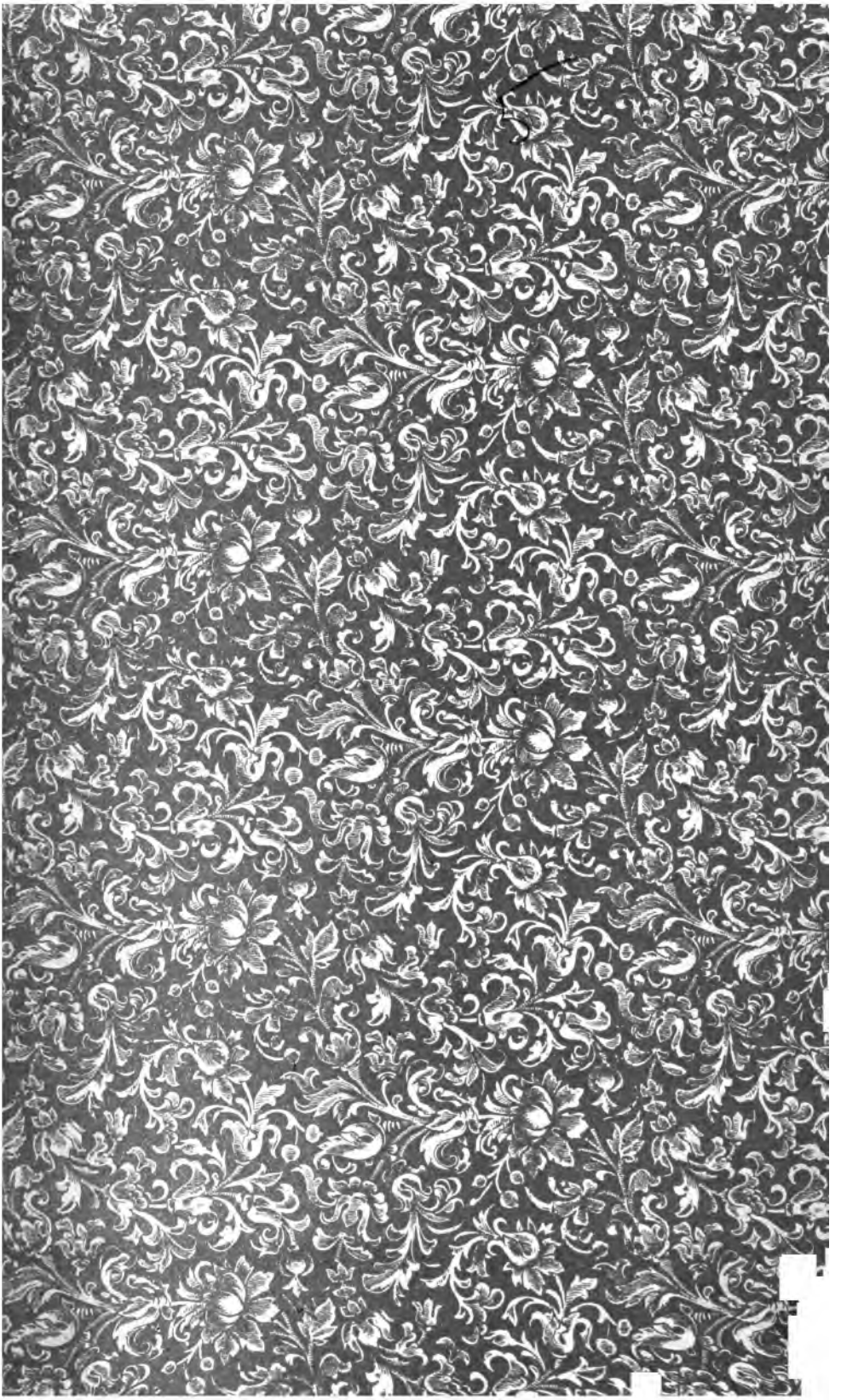

The American Academy of
Railway Surgeons

OFFICIAL REPORT

OF

TENTH MEETING

Held at Chicago, October 1st and 2d, 1903

EDITED BY

D. S. FAIRCHILD, M. D.
DES MOINES, IOWA.

Reprinted from "The Railway Surgeon" and
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PREFACE

This volume will be the last of the series of "Transactions of the American Academy of Railway Surgeons."

After nine years of successful effort in the advancement of railway surgery it became apparent that a wider field of usefulness could be reached by a plan of reorganization which should include the idea of the old Academy as a central body and the affiliation of all railway surgeons as associate members represented in the central body by delegates. The plan met with such widespread approval that the new organization was formed without friction under the name of the American Association of Railway Surgeons.

Henceforth the transactions will appear in the journal of the American Association of Railway Surgeons. EDITOR.

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AMERICAN ACADEMY OF RAILWAY SURGEONS.

MINUTES OF THE TENTH ANNUAL MEETING, HELD AT CHICAGO, ILL., OCTOBER 1 AND 2, 1903.

The academy convened in annual session in Room L 38, Great Northern Hotel, and was called to order at 10 a. m. by the president, Dr. L. Sexton.

In the absence of the secretary and treasurer, Dr. T. B. Lacey, Dr. H. B. Jennings was elected secretary pro tem.

Reading of minutes of last meeting were dispensed with, as they had been published in The Railway Surgeon.

Dr. John E. Owens, chairman of the committee on transportation, made his report, which was approved of, and, upon motion, carried. Committee was discharged.

The report of Treasurer Dr. T. B. Lacey was read and referred to Dr. O. B. Quinn and Dr. Wilson to audit and report upon.

A bill amounting to $3 for monies expended by Dr. R. Harvey Reed was presented and, upon motion, allowed.

The following applications, accompanied by the usual fee, were read and referred to the executive board:

Dr. Walter Courtney,	Dr. W. D. Redens,
Dr. Frank Allport,	Dr. Martin W. Bacon,
Dr. M. A. Beach,	Dr. Hugh Logan,
Dr. Rich'd F. Harrell,	Dr. J. Z. Barnett.
Dr. W. H. Palmer,	

The executive board reported favorably upon the above named surgeons, and, upon motion, carried, the rules were suspended and the secretary was instructed to cast the ballot of the academy for their admission, which was done, and they were declared duly elected to fellowship.

The society then went into scientific session. Upon

motion, seconded and carried, the reading of the president's address was deferred until the afternoon session.

Dr. F. A. Butler then read a paper, entitled "Fractures of the Humerus, Followed by Paralysis of the Arm," which was discussed by Drs. H. C. Fairbrother, Harvey Reed, D. S. Fairchild, J. A. Quinn, F. O'N. Kane, and L. Sexton, Dr. F. A. Butler closing.

"Crushing Injuries of the Extremities" was the title of a paper presented by Dr. Jere L. Crook, in which he advised conservatism in their treatment and gave the history of several cases, illustrated by photographs showing excellent results obtained where amputation at first seemed inevitable. The paper was discussed by Drs. Harvey Reed, E. O'N. Kane, A. B. Brumbaugh, Dean, F. A. Butler, J. A. Quinn, and closed by the author.

Dr. I. F. Crosby then presented a paper, title of which was "Severe Injuries of the Large Joints," which was discussed by Drs. A. B. Brumbaugh, H. C. Fairbrother, R. H. Reed, H. Sneve, J. L. Crook and L. Sexton; discussion closed by essayist.

The society then adjourned until 2 p. m.

AFTERNOON SESSION.

The society reconvened at 2 p. m. in executive session, Dr. L. Sexton presiding. The reading of minutes of previous session dispensed with. The applications of Drs. T. D. Palmer, J. E. Minnee and A. Howard Smith, accompanied by the fee, were presented and referred to the executive board, who reported favorably upon their admission, and upon motion, carried, the rules were suspended and the secretary instructed to cast the ballot of the society for their admission. The secretary cast the ballot, and they were declared duly elected. Dr. German then presented the following resolution, which was unanimously adopted:

Resolved, That the secretary pro tem. be instructed to telegraph to our secretary and treasurer, Dr. T. B. Lacey, our affectionate greeting and our sympathy in his enforced absence from this meeting.

Scientific Session.—Dr. H. B. Jennings read a paper, the title of which was "The Physical Examination of

Railway Employes," which was discussed by Drs. John E. Owens, J. E. Minnee, R. H. Reed, H. C. Fairbrother, Frank Allport, C. E. Bellows and D. S. Fairchild.

The president then read his address, title "The Value of Injury in the Light of Court Decisions," which, upon motion, was referred to committee for publication.

Dr. Frank Allport then presented a paper entitled "Some Remarks Concerning the Ocular and Aural Examination of Railway Employes." The discussion of this paper was postponed until Dr. D. S. Fairchild could make his report as chairman of a committee appointed by the president at last year's meeting to report upon a communication from the secretary of the American Railway Association relative to uniform requirements in the physical examinations of employes. Dr. D. S. Fairchild's report followed and was discussed by Drs. John E. Owens, J. E. Minnee, Mr. R. C. Richards and Dr. Frank Allport, who moved the committee be continued until to-morrow morning, to give them time to make any changes that might be thought advisable and then make final report. The motion carried.

Dr. A. H. Andrews next read a paper entitled, "The Tuning Fork as a Hearing Test," after which the society adjourned until 9 a. m., October 2.

SECOND DAY—MORNING SESSION.

The society called to order by the president.

Executive Session.—Applications for membership from Drs. W. H. Condit and H. L. Getz were presented, accompanied by the fee, and referred to the executive committee and favorably reported upon.

Upon motion, rules were suspended and secretary was instructed to cast ballot of society for their admission, which was done, and they were declared elected to membership. Dr. H. Reineking handed in his resignation as an active member and was unanimously elected to honorary membership.

Scientific Session.—Dr. A. Wilson read paper, the subject of which was "Occurrence of Rheumatism with Minor Injuries to the Back." Discussed by Drs. Wood,

H. C. Fairbrother, W. U. Cole and A. L. Wright, and closed by author.

Dr. D. S. Fairchild's report was then called for. Dr. J. F. Pritchard moved:

That only those directly interested, chief surgeons and those passing on applications, hold a conference and then make a report. Seconded. Upon a rising tie vote, the president voted "No," and declared the motion lost.

Dr. D. S. Fairchild then read the report and Dr. John E. Owens moved its adoption, which was seconded and carried. Dr. John E. Owens moved that Dr. M. L. Harris be now asked to read his paper, as he was present. Carried.

Dr. Harris then read a very interesting and instructive paper, the title of which was "Traumatic Influence in Producing Movable Kidney." Dr. John E. Owens moved the thanks of the society be extended to Dr. M. L. Harris for presenting this valuable paper. Unanimously carried. The paper was discussed by Drs. H. C. Fairbrother, James H. Dunn, R. H. Reed, John E. Owens and D. S. Fairchild; closed by the author.

Dr. C. H. Mayo's paper, next upon the regular program, "Surgery of the Skull and Brain," was read. Upon motion the discussion upon this and the other papers, composing the symposium, was postponed until they were all read.

Dr. John E. Owens read a paper, entitled "Injuries to the Spinal Column."

"Injuries to the Spine" was the subject of a paper read by Dr. Haldor Sneve.

Society then went into executive session.

A letter from Dr. J. N. McCormack, Bowling Green, Ky., in which he stated it was the desire of the American Medical Association to so co-ordinate the medical organizations of this country as to concentrate or unify all efforts being made for the advancement of the profession, and asked the society to consider the advisability of affiliating with this body.

Upon motion, carried, the president was asked to appoint a committee to report upon the matter, and he

appointed Drs. D. S. Fairchild, Haldor Sneve and German on this committee.

Society then adjourned until 2 p. m.

AFTERNOON SESSION.

Scientific Session.—Dr. J. F. Pritchard read a paper, entitled "Head Injuries."

The subject of the next paper was "Injuries to the Head," which was read by Dr. W. U. Cole.

The society then went into executive session to hear the report of the committee appointed to audit the treasurer's report. The committee reports as follows:

"We, your committee, appointed to investigate and audit books of secretary and treasurer, beg to report that we have examined ledger and itemized report of the said officer, and find books kept in a neat and correct manner and his report correct, as follows:

Balance on hand, last report	$358.08
By amount dues collected to September 28, 1903	425.00
Credit	$783.08
To amount paid as per list of receipts attached to report	$251.20
By amount on hand, check presented	531.88

(Signed) O. B. Quinn and Elsworth Wilson.

Society then reconvened in scientific session. Dr. A. L. Wright read a paper entitled "Fractures at the Base of the Skull."

"Blind Fissure Fractures of the Skull" was the subject of a paper written by Dr. Ira B. Bartle, read by title by the secretary.

The society then went into executive session for the purpose of electing officers.

The result of the election was as follows:

President—Dr. S. C. Plummer.

First vice-president—Dr. A. L. Wright.

Second vice-president—Dr. W. U. Cole.

Secretary and treasurer—Dr. T. B. Lacey; Dr. H. B. Jennings, assistant.

Editor—Dr. D. S. Fairchild.

Member executive board—Dr. W. W. Grant.

Place of meeting, 1904, Chicago. Time of meeting to be appointed by the executive board, with a request that an early decision be made.

Dr. E. O'N. Kane presented a paper, which was read by title by secretary, "Exhibition of Knife with New Curve."

The previous papers were then discussed by Drs. James H. Dunn, D. S. Fairchild, R. H. Reed, S. C. Plummer, Miller, and closed by Drs. Haldor Sneve and A. L. Wright.

Dr. A. B. Brumbaugh read paper entitled "Diet, Bearing of, in Surgical Cases."

Dr. M. W. Bacon presented a paper, the title of which was "Conservative Railway Surgery with the Aid of Hospital Facilities."

Dr. R. H. Reed moved the following be read by title, which was done by secretary.

Address, Samuel A. Lynde, Esq.

"Surgery of Spinal Column," Dr. A. F. Jonas.

"Treatment of Injuries of the Head, Recent and Old," Dr. George Halley.

"Slight Injuries," Judge C. O. Hunter.

"Immediate Treatment of Eye Injuries," Dr. G. E. Bellows.

Dr. E. Wyllys Andrews then read a paper entitled "Radical Cure of Hernia Among Railroad Employes."

Dr. D. S. Fairchild then presented the report of the committee appointed to act in the matter of affiliating with American Medical Association. The report was that it was the opinion of the committee the time was not ripe at present to adopt the suggestion, and the secretary be instructed to so inform Dr. J. N. McCormack.

Dr. R. H. Reed moved that the editor and executive committee be instructed to renew the contract with The Railway Surgeon and try to get reprints in book form, if they should think advisable. Motion carried.

Dr. D. S. Fairchild addressed the members on the advisability of amalgamating with the International Association of Railway Surgeons.

Dr. R. H. Reed moved that Dr. D. S. Fairchild, the

president and executive committee, be made a committee to bring forward some plan for the formation of one society. Motion carried.

Dr. James H. Ford, president of the International Association of Railway Surgeons, was present and addressed the academy, advocating union of the two societies.

Society then adjourned, sine die.

REPORT OF COMMITTEE ON UNIFORM STANDARD FOR THE EXAMINATIONS OF RAILWAY EMPLOYES.

BY D. S. FAIRCHILD, CHAIRMAN.

Section 1. It is essential that railroad corporations should require definite and scientific examinations of the sight and hearing of those employes who will be at all concerned with the active operating of trains, or in giving or receiving signals.

Section 2. Such examination should, *whenever possible,* be made by regular appointed eye and ear surgeons.

Section 3. New men should be required to hear the spoken voice or acoumeter at 20 feet in a quiet room in each ear. The acoumeter is recommended as the most accurate means of testing the hearing.

Section 4. The acuteness of vision should be tested by the test types of Prof. Snellen or those which conform to his standards.

Section 5. The color perception should be tested by means of the colored worsteds of Prof. Holmgren, preferable with worsteds tagged for the purpose of record.

Section 6. There should be two general standings of visual and aural requirements, viz: one for new men hoping to enter the service and to be actively engaged in the operation of trains, and in giving and receiving signals; and one for those men engaged in similar work, who have been uninterruptedly in a company's service for five years, either the company from which employment is sought, or some other company enforcing similar regulations. These latter may be regarded as old employes.

Section 7. Re-examination should be made of all such employes every three years; and after any severe illness, or accident, or any occurrence which seems to cast doubt on the visual and aural capacity of the individual. Re-

examination should also be made more frequently on men known to be excessive users of tobacco or to be suffering from syphilis, albuminuria, diabetes, or acute or chronic eye diseases. They should always be examined before promotion.

Section 8. Men known to be excessive users of liquor should not receive employment for the services above designated. The co-operation of employes themselves should be sought by regulations that will encourage them to report promptly any temporary impairment of vision or hearing.

INSTRUCTIONS GOVERNING SURGEONS IN CONDUCTING EXAMINATIONS OF APPLICANTS FOR EMPLOYMENT IN OR ABOUT TRAIN SERVICE OF THE RAILROAD COMPANY.

Examining Surgeons shall be provided with the following articles, to be used in making examinations:

1. A card of Snellen's Test Types.

2. A set of wools for testing color perception. (Do not expose to light any longer than necessary.)

3. An acoumeter for testing the hearing.

Applicants must bring with them application forms in duplicate and a letter from the employing officer requesting examination.

After conducting the tests for vision, color perception, and hearing and the examination for other physical defects, the Examing Surgeon will fill out and sign in duplicate the blank certificate found on the application blanks and forward one to the Division Superintendent or Division Master Mechanic and one to the Chief Surgeon.

EXAMINATION OF VISUAL ACUTENESS.

A card of test types should be fastened in a good light to a wall, the bottom of the card being about five (5) feet from the floor.

Place the applicant twenty (20) feet from the card, cover one of his eyes and instruct him to read with the other such letters as may be indicated. Each eye should be tested separately and the degree of visual power expressed in fractions.

Examiners are reminded that the normal eye should

read at twenty (20) feet the line marked 6m. or D.-20. Such being the case, the visual power should be expressed by the fraction 20-20. Should the applicant at the distance of twenty (20) feet be unable to read this line, but be able to read the next line above (10m. or D.-30), the result would be by the fraction 20-30. If he can, at twenty (20) feet, only read the letters marked 12 m. or D.-40, the record should be 20-40, etc.

HEARING.

The applicant should be able to hear a distinct and loud whisper or acoumeter at the distance of twenty (20) feet, in which case the hearing power would be expressed by the fraction of 20-20. Should the applicant fail to hear such a whisper or acoumeter at twenty (20) feet but be able to hear at ten (10) feet for instance, the hearing power should be expressed by the fraction 10-20, etc.

EXAMINATION IN COLOR PERCEPTION.

Examiners are furnished with a set of color worsteds, lettered A, B, C, and numbered from 1 to 40. These wools are divided into three groups, distinguished as follows:

Group A, containing the light green skein A, the green shades numbered 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, and the gray confusion shades numbered 1, 3, 5, 7, 9, 11, 13, 15, 17, 19.

Group B, containing the pink or purple skein B, the pink or purple shades number 22, 24, 26, 28 and 30, and the blue confusion shades numbered 21, 23, 25, 27, 29.

Group C, containing the red skein C, the red shades numbered 32, 34, 36, 38 and 40, and the brown confusion shades numbered 31, 33, 35, 37 and 39.

MANNER OF USING THE SKEINS.

Mix the 40 skeins thoroughly and throw them on a table in a good light. Place skein A about 2 feet distant from the pile of worsted and instruct the applicant to pick out the different shades of the same color. The examiner having satisfied himself of the ability or inability of the applicant to select the proper skeins, should

record the numbers of the skeins selected, and return them to the pile. The examiner should then place the skeins B and C successively near the pile of worsteds to be treated in the same manner.

In testing for defects in color perception, examining surgeons may be guided by the following brief suggestions.

1. In case an applicant fails to comprehend the test, he may be directed to step aside and watch another applicant select the skeins, or in the absence of another applicant, the surgeon may himself go through the test. This method is valuable in case of color blindness, as the applicant is convinced against his will that the test is a fair one.

2. Do not under any circumstances call the color of a skein. All tests in which the applicant is requested to name colors or shades are incorrect. The object of the test is to discover whether the applicant can properly classify shades of primary colors, and it is important after he thoroughly understands what is expected of him, not to render him any assistance.

3. It is well, if necessary, to explain the differences between colors and shades; for example: Blue, green, red are colors. Light blue, dark blue, pea green, Venetian red, are shades of these colors. The applicant, however, should not be informed of the names of the colors or the names of any of the skeins.

The examiner should watch the applicant closely and note any hesitancy in selecting the skeins, especially when he appears undecided whether or not to select a confusion color. Should he evince a strong tendency to select any confusion color, even if he does not actually select it, the number of the color should be recorded.

4. Recollect, however, that blue is not a confusion color for green, but only for pink (purple). It must be borne in mind that many men, not particularly ignorant in other matters, find it difficult to distinguish between light shades of blue and green, or between red and orange. This defect is one merely of education, is not color blindness and should not reject a candidate. In

case such ignorance is manifested it may be well to call the applicant's attention to the fact that he is not well posted in colors.

5. In case of color blindness, the applicant usually adopts one of two courses. He may boldly and rapidly select a number of skeins at random, throwing them down with a great show of confidence, or he will laboriously study over the skeins carefully, selecting a few of the correct colors, and a few—often not more than 1—of the confusion colors, always hesitating and usually selecting shades of nearly the same intensity, whether matches or confusion colors; for example, light green, light gray, light purple and light blue. The infirmity of applicants adopting the first course is usually easily to detect, but it is often difficult to distinguish between a man who is hesitating and vacillating on account of lack of purpose or from color ignorance, and one who is so on account of actual deficiency in color perception. In these latter cases it is well to instruct the applicant not to handle the wool until he has determined what skeins he wishes to select.

DIAGNOSIS.

a. He who places beside skein A one of the "colors of confusion" (odd numbers), 1-19, that is to say, finds that it resembles the "test color," is color blind. He who, without being quite guilty of this confusion, evinces a manifest disposition to do so, has a feeble chromatic sense.

b. He who is color blind by the first test, and who upon the test of skein B selects only the correct sk ns, is incompletely color blind.

c. He who, in the second test, selects the purple, the green and gray shades also, or one of them, is completely green-blind.

d. The tests with skeins C (which is applied only to those completely green or red blind) should be continued until the person examined has placed beside the specimen all or the greater part of the skeins belonging to this color or else one or several "colors of confusion" (odd skeins 31-39). In this test the red-blind individual

chooses beside the red shades, olive green and dark brown shades of a darker quality than the red test skein. On the other hand, the green-blind individual selects similar confusion colors, but of a quality lighter than the red test skein.

e. All degrees of color blindness shall be regarded as completely color blind for the purposes of this examination.

CLASSES.

In the first class of those with normal hearing, color sense and visual power, are included the following: engineers, firemen, engine dispatchers, conductors, brakemen, yard masters, switchmen, signal men and train baggage men.

In the second class, which includes station agents, telegraph operators, station baggage men, switch tenders, section foremen, bridgemen, railroad crossing flagmen, watchmen and crossing flagmen, normal color sense and normal hearing are demanded, but applicants in this case may be accepted with 20-40 visual power in one eye, provided that of the other eye be normal, or with 20-30 visual power in each eye.

No applicant shall be accepted who is compelled to wear glasses in order to meet the above requirements.

Firemen and brakemen examined for promotion may be accepted with 20-20 in one eye and 20-30 vision in the other, provided they have no other defects. It is understood, of course, that this does not apply to applicants for service.

Old employes not seeking promotion may be continued in the service if by using glasses vision can be brought to 20-30 in each eye.

1. Applicants with trachoma or other inflammatory conditions of the eye or with chronic discharges from the ear are disqualified.

2. Varicose veins of both legs, or marked varicosity in one leg; phlebitis; skin diseases, especially eczema, or even a strong tendency to it; loss of thumb, or loss of two fingers of one hand, disqualify the first class, and station baggagemen and switch tenders in the second

class, while crossing flagmen, agents, operators, section foremen, bridge foremen, watchmen and railroad flagmen may be accepted with loss of thumb or loss of two fingers of one hand. Hernia disqualifies both classes.

3. Unmistakable evidence of chronic alcoholism disqualifies both classes.

4. Acute gonorrhea and the primary and secondary manifestation of syphilis, traumatic and pathologic bubo, disqualify both classes, as long as the symptoms are apparent.

5. Orchitis; epididymitis; hydrocele; undescended testicle; malignant tumors; recurring appendicitis; old depressed fractures of the skull, or any fracture followed by head symptoms; spinal injuries; epilepsy; antero-posterior curvature, severe injuries of the back; tuberculosis; marked scrofulous cachexia; aneurism; necrosis; acute and chronic periostitis; acute and chronic cystitis, disqualify both classes.

6. Synovitis; arthritis; floating cartilage, and impaired mobility of joints disqualify the first class and all of the second class, except agents and operators, who may be accepted if inflammation has long since subsided and the affected joints be free from pain.

7. From a medical standpoint diabetes; chronic rheumatism and gout; chronic diarrhea; chronic hepatic disorders attended with jaundice, or those that are disabling in their nature; hepatic, cardiac or renal dropsy; asthma; hemoptysis; tuberculosis; valvular disease of the heart; angina pectoris; evidence of organic disease of brain, or spinal cord; insolation; inveterate neuralgia of the larger nerves, disqualify both classes.

8. No applicant who has lost an arm, leg or hand shall be accepted for any position whatever, except by special arrangement with the Superintendent, Claim Department and Chief Surgeon.

9. Under the head of disqualifying defects, surgeons will be careful to note any physical defects that would impair the usefulness of the applicant; that would be more or less aggravated by the service, or that would contribute to the prolongation of disability in case of injury.

10. In order to prevent fraud in subsequent claims for personal injury, a careful record must be made, in the proper place, of physical defects which do not impair the usefulness of the applicant; that would not be aggravated by the service, or that would not contribute to the prolongation of disability in case of injury.

11. In case the applicant does not furnish a certificate that he has been successfully vaccinated within three years, he should be vaccinated.

SOME REMARKS CONCERNING THE OCULAR AND AURAL REQUIREMENTS OF RAILROAD EMPLOYES.

BY FRANK ALLPORT, M. D., OF CHICAGO, ILL.,
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Some three years ago the Interstate Commerce Commission published an interesting report of railway accidents occurring in the United States in one brief year. There is no reason to suppose that this was an especially unfortunate year, and as the figures are instructive and pregnant with significance I will repeat some of them to this society, although they have probably been read by every gentleman present.

The total number of personal accidents was 51,743, and of these 7,123 were killed, 2,210 being railway employes; 334 employes were killed and 2,153 injured by collisions and derailment, and 82 passengers were killed and 1,557 passengers injured from the same cause.

The causes of these accidents are doubtless numerous, but have not been, so far as I am aware, statistically enumerated, although such tabulation would be most interesting and instructive. A small minority of the accidents were perhaps in the ordinary course of events unavoidable, but a large majority were probably preventable, and due to carelessness or physical defects on the part of train operators. Of such physical defects it is reasonable to suppose that ocular and aural defects (especially the former) played a most important part, for no physical condition (except the mental condition) is so intimately connected with the actual moving of a train as vision. The eyes are continually in service, watching for signals, both luminous and non-luminous, looking at the track and searching for approaching trains, familiar objects, etc. In short, there is not a moment during the active

operation of a train that the engineer and his fireman have not a vital interest in good vision, and the same is true in a mitigated sense of the conductor, brakemen, switchmen, bridgemen, etc.

I am confident that if statistics could be gathered of the accidents caused by bad eyes, even for a single year, the showing would be so appalling that every intelligent railway official would require no further incentive to perfect the ocular status of his men.

In order to ascertain what was being done to regulate this important essential to transportation security, a committee was appointed (of which I was chairman) some years ago by the Ophthalmologic Section of the American Medical Association to investigate this matter and report back to the section. Owing to many obstacles, the committee was not able to report finally until the year 1901 at the St. Paul meeting of the association. Meanwhile we gathered statistics which have proven of immense value in placing the work upon a solid foundation, which I will very briefly enumerate, although most of you have probably already read them in the issues of the Journal of the American Medical Association.

Letters of inquiry and a question blank were sent to every railroad in North America possessing a mileage of over 100 miles of road, and 244 companies were thus addressed, operating a total of 205,638 miles. One hundred and twelve roads replied, aggregating 147,838 miles of road. These figures represent almost all the large systems, for those not replying were principally the small railroads, many of whom have now been merged into the larger systems, whose operating policies are of a probably broader character, and it is only fair to presume that those roads not replying to the letters of inquiry kept silence because their methods were not above criticism. I found that out of 112 roads, 77 require some kind of a systematic eye and ear examination of those employes who are actively engaged in running trains, and giving and receiving signals. Twenty-nine of the roads require such examinations to be made by regularly appointed railway surgeons, 31 allow various kinds of railway em-

ployes to make the examinations, 9 roads send doubtful cases to an eye and ear surgeon, 16 require examinations to be made by regularly appointed eye and ear surgeons, and 4 allow such examinations to be made by the medical directors of railway associations.

In answer to the question: "Do you require re-examination from time to time, and, if so, at what interval or under what circumstances?" I find that one road requires re-examination every six months, seven require re-examinations every year, 21 roads every two years, 9 roads every three years, 2 every four years, 19 roads require re-examinations when it is deemed advisable and especially upon promotion and after accidents and illness, and 3 roads require re-examination upon promotion only.

Concerning the question, "Do you require perfect vision, color sense and hearing in new employes, and what concessions do you permit from a perfect standard in the case of old employes?" I find that 26 roads require perfection and allow no concessions to old employes; 41 roads require perfection from new employes and allow various concessions to old ones, according to circumstances.

Concerning the question, "How long must a man work for your road before you call him an old employe?" I find that 2 roads call a man an old employe as soon as he is enrolled in the service, 6 roads require one year's service, 3 roads two years, 12 roads three years', 12 roads five years', 7 roads ten years', 3 roads 15 years'.

Concerning the question, "Do you permit old employes to wear glasses for distance when on duty?" I find that no road allows new applicants to wear glasses for distance in order to bring vision up to a normal standard, 74 roads allow old employes to wear glasses for distance; 12 roads do not allow glasses to be worn for distance at all.

The report of the committee which was presented at the St. Paul meeting was as follows:

"Section 1. The essential principle to be advocated is that railroad corporations shall require a scientific and correct examination of the eyes and ears of those em-

ployes at all to be concerned with the active operating of trains, or in giving or receiving signals.

"Section 2. Such primary examinations should, whenever possible, be made by regularly appointed eye and ear surgeons, and this fact is emphatically urged, especially as the expense of a first examination may always be borne by the applicant; but if such a course is not deemed expedient, the company's surgeon, aided by his medical assistants, might conduct them, with the understanding that all doubtful cases shall be sent to a regularly appointed eye and ear surgeon.

"Section 3. There shall be two general standards of visual and aural requirements, viz: those for new men hoping to enter the service, and to be actively engaged in the operation of trains, and in giving and receiving signals; and secondly, those men engaged in similar work, who have been uninterruptedly in a company's service for five years, and who have, therefore, a right to be called *"old"* employes.

"Section 4. New men shall be required to possess perfect color sense. They shall also have a vision of 20-20 in each eye, without glasses, and have healthy eyes, and not over 1 diopter of hypertropia. They shall also hear the whispered voice at 20 feet in a quiet room, and have healthy ears.

"Section 5. For the purpose of graduated requirements, old employes shall be divided into two classes, as follows: Class A.—Engineers, firemen, conductors, brakemen, switchmen, signal-men, switchtenders and engine dispatchers. Class B.—Track foremen, bridge foremen, crossing flagmen, bridge tenders, gatemen, train baggage men, telegraph operators, station agents, and station baggage men.

"Employes enumerated in Class A shall not be retained in such positions if vision sinks below 20-30 in one eye and 20-40 in the other, or if the whispered voice cannot be heard in a quiet room at 15 feet by one ear and 10 feet by the other. Employes enumerated in Class B shall not be retained in such positions if vision sinks below 20-40 in one eye and 20-50 in the other, or if the whispered voice cannot be heard in a quiet room at 10 feet by both ears. Employes, and especially engineers and firemen, enumerated in Class A must reach the visual standard without glasses and will not be allowed to wear distance glasses when on duty. Employes enumerated in Class B may reach the visual standard with glasses, and will be allowed to wear glasses when on duty, and will be required to do so if the wearing of

glasses is necessary to bring vision up to the proper standard, and shall always be required to carry an extra pair of glasses when on duty, in case of accident to one pair. All employes shall have perfect color sense.

"Section 6. Re-examination shall be made of all men every three years, and after a severe illness, or accident, or any occurrence which seems to cast doubt on the visual and aural capacities of the individual. Re-examinations shall also be made more frequently on men known to be excessive users of tobacco, or to be suffering from syphilis, albuminuria, diabetes, or acute or chronic eye and ear diseases. Men shall always be re-examined before promotion.

"Section 7. Men known to be excessive users of liquor shall not receive employment.

"Respectfully submitted,"

This report was adopted by the Ophthalmologic Section, and the committee requested to carry it up to the House of Delegates of the American Medical Association at its next meeting at Saratoga, which was accordingly accomplished. Owing to some diversities of opinion and individual opposition the resolutions as presented in the Ophthalmologic Section had to be remodeled in order to insure their passage. The resolutions as remodeled, I now beg leave to present:

"Section 1. It is essential that railroad corporations should require definite and scientific examinations of the sight and hearing of those employes who will be at all concerned with the active operating of trains or in the giving or receiving of signals.

"Section 2. Such examinations should, whenever possible, be made by regularly appointed eye and ear surgeons; and in all cases be conducted according to the instructions, and under the supervision of a regularly appointed eye and ear surgeon, and with apparatus and under conditions approved by him, and all doubtful cases should be referred to him for personal examination.

"Section 3. New men should required to hear the spoken voice at 20 feet in a quiet room, and have healthy ears.

"Section 4. The acuteness of vision should be tested by the test types of Professor Snellen, or those which conform to the standards.

"Section 5. The following minimum requirements should be adopted for acuteness of vision:

CLASS A.

	Entrance to service or promotion.	Re-examination of those in the service.
Enginemen (road service). Firemen (road service).	20-20 in each eye tested separately without glasses.	20-30 with both eyes open, without glasses. Each eye should also be tested separately and the vision of each noted.
CLASS B.		
Other employes in the engine, train or yard service, and car and engine inspectors.	20-20 in one eye and not less than 20-40 in the other. Tested separately without glasses.	20-40 with both eyes open, without glasses. Each eye should also be tested separately and the vision of each noted.
CLASS C.		
Towermen, telegraph operators, station agents, section foremen.	20-20 in one eye and not less than 20-40 in the other. Tested separately, with or without glasses.	20-40 with both eyes open, with or without glasses. Each eye should also be tested separately and the vision of each noted.
CLASS D.		
Crossing flagmen.	20-40 with both eyes open, with or without glasses.	20-50 with both eyes open, with or without glasses.

"Section 6. The color perception should be tested by means of the colored worsteds of Professor Holmgren, preferably with worsteds tagged with the purpose of record; also, that in every case an additional test should be made with a lantern showing a number of colored lights, which can be varied in their size and intensity.

"Section 7. (a) Employes enumerated in Class A must reach the visual standard without glasses and should not be allowed to wear distance glasses when on duty.

"(b) Employes enumerated in Classes B, C, D, should be allowed to wear glasses when on duty, and should be required to do so if the wearing of glasses is necessary to bring the vision up to the proper standard. They should also be required to carry an extra pair of glasses when on duty, in case of accident to one pair.

"(c) Employes enumerated in Class A should not be retained in such positions if the vision sinks below 20-30 with both eyes open, or if the spoken voice is not heard in a quiet room at 15 feet.

"(d) Employes enumerated in Classes B and C should not be retained in such positions if vision sinks below 20-40 with both eyes open, and Class D, whose mini-

mum standard should be 20-50; or if the voice cannot be heard in a quiet room at 10 feet by both ears.

"Section 8. There should be two general standards of visual and aural requirements, viz: One for new men hoping to enter the service, and to be actively engaged in the operating of trains, and in giving and receiving signals; and one for those men engaged in similar work who have been uninterruptedly in a company's service for five years, either the company from which employment is sought, or some other company enforcing similar regulations. These latter may be regarded as old employes.

"Section 9. Re-examinations should be made of all such employes every three years; and after any severe illness, or accident, or any occurrence which seems to cast doubt on the visual and aural capacity of the individual. Re-examinations should also be made more frequently on men known to be excessive users of tobacco, or to be suffering from syphilis, albuminuria, diabetes, or acute or chronic eye or ear diseases. They should always be examined before promotion.

"Section 10. Men known to be excessive users of liquor should not receive employment for the services above designated (Section 5). The co-operation of the employes themselves should be sought by regulations that will encourage them to report promptly any temporary impairment of vision or hearing.

"Respectfully submitted on behalf of the Section on Ophthalmology of the American Medical Association."

These resolutions have been sent to every railroad in North America, and have accomplished an immense amount of good already. Many roads who have never taken up this work at all, having expressed a determination to put it into execution at once, and others who have been using inferior methods express themselves as intending to improve such methods along the lines indictated by the committee.

There are a few important points of difference between the report of the committee adopted by the Ophthalmologic Section and that adopted by the House of Delegates of the American Medical Association. For instance: in Section 2 the Ophthalmologic Section report reads, "Such primary examinations should, whenever possible, be made by regularly appointed eye and ear

surgeons, etc." The same Section as adopted by the House of Delegates, reads, "Such examinations, etc." The Ophthalmologic Section felt that it did not wish to draw the lines too hard upon the railroads, and therefore used the word "primary," feeling that if the first or entrance examinations were made by the company's eye- and ear surgeon, that the subsequent examinations might with reasonable safety be left with the company's surgeons for execution, with the understanding that doubtful cases would be referred to the company's eye and ear surgeon for decision.

Section 3 of the Ophthalmologic Section report corresponds with Section 8 of the House of Delegates' report, and I have no hesitation in saying that I regard one feature of the latter report as superior to the former, viz: the clause which refers to the interchangeableness of positions from one road to another whose requirements are similar, without losing the right to be regarded as an old employe. I am convinced that a man who has undergone primary examinations for one road and been accepted and placed at work, should be able to go to work for another road whose physical requirements are essentially similar, without losing the benefits of his time privileges. This feature of Section 8 of the House of Delegates' report I cordially endorse, and hope it may become generally operative.

I find no reference in the House of Delegates' report, except as found in Section 6, (which contains nothing of an obligatory or mandatory character), concerning the requirements for color sense. The only explanation for this omission is, of course, the presumption that it is an oversight and I should recommend that a clause be inserted in Section 5, after the words "acuteness of vision" (in the House of Delegates' report) to read as follows: "it being understood that all employes at all concerned in the active operating of trains, and in giving or receiving signals, should have perfect color sense."

Under Section 5, House of Delegates' report, under the requirements for re-examinations of those in the service "belonging to Class A," it says "that the em-

ploye shall possess a vision of 20-30 with both eyes open, without glasses. Each eye should also be tested separately and the vision of each noted." This opens a wide avenue of discussion. The report of the Ophthalmologic Section concerning this same point says that "employes enumerated in Class A shall not be retained in such positions if vision sinks below 20-30 in one eye and 20-40 in the other." In other words a reasonable standard is required of each eye, and it seems as if this must appeal to the judgment of anyone at all familiar with such work. Would anyone in this Academy care to travel on a train at the rate of 50 or 60 miles an hour with an engineer wearing a glass eye? I think not; the idea is untenable, and yet this is exactly what the House of Delegates' report permits, for it says that vision must be 20-30 *with both eyes open.* To be sure it also says, "Each eye should be tested separately, and the vision of each *noted,*" but it goes no further, it does not inflict any penalty in case an engineer has one blind eye.

While disposed to be most liberal with the old employes of a road, and while recognizing its advisability and almost necessity if good service and freedom from labor union complications are to be encouraged, I still cannot endorse the idea of testing with both eyes open, and of ignoring the condition of a man's worst eye. The idea is evidently conceived from the action of the Internationau Congress, which met in Amsterdam in 1879, and which in formulating rules for the ocular condition of transportation employes, under the guidance of Professor Donders, repeatedly speaks of testing with "both eyes open." This was evidently recommended because it is well known that one eye assists the other to see, and the Committee desired to treat all employes with all possible clemency, but they did not in their recommendations ignore the condition of either eye; for instance, in the case of engineers and firemen, while visual acuteness with both eyes open must be normal, still the worst eye must have visual acuteness of not less than one-half. Station-masters, etc., must have a vision

in the worst eye of not less than one-quarter, etc., so that the recommendations of the House of Delegates in absolutely ignoring the visual capacity of the worst eye in case of re-examinations seems to so far transgress the laws of good judgment as to make it only reasonable that this feature should be amended. In making such amendments I feel that several things should be considered, and while being, perhaps, as anxious for the maintenance of a high standard as anyone, and while unwaveringly insisting upon perfection in the case of new employes, I increasingly feel that we must be most liberal in our concessions to old employes, and the older they are, and the longer they have worked for a certain company, the more liberal must we be. This conclusion has been reached after a long and extensive experience with railroad men, and while feeling that public safety must always be subserved, and it would be most beautiful if ideal and altruistic conditions might always be obtained, we, nevertheless, cannot entirely ignore the practical issues of the problem.

For instance: Here is an engineer who has worked in this capacity for forty years for a single company. He is an old man of much experience and excellent judgment, and has never had an accident that could be attributed to poor vision and yet, nevertheless, has now a vision which has become reduced to 20-70 in one eye, and 20-50 in the other, without glasses. When his vision is corrected with glasses his vision can be improved to say 20-40 in one eye and 20-30 in the other. Now let me ask you what are you going to do with that man? This is a question which must frequently be answered, because a large proportion of old engineers have poor vision and sooner or later must face this problem. I think that in laying down rules for the solution of such a question, great latitude must be observed and the utmost paucity of vision, consistent with actual safety of train service, must be liberally computed. In making such calculations we should likewise remember that we can never be certain that we are correct in our deductions; we are simply expressing our own opinions aided by the

opinions of others, but we have no way of knowing whether we are really right or wrong, therefore we should not be too dogmatic in our ideas or too intolerant of the opinion of others. We should not fail to remember that as a man waxes in age he also usually waxes in experience and good judgment, and what he lacks in vision and other physical attributes he makes up in other qualities, nearly if not quite as valuable. Many of the best and most trusted engineers on all roads unfortunately possess very poor vision, and yet get into very little trouble, not because their vision is so poor but because they are ripe with practical experience and wisdom.

Then comes the question of glasses, or in other words, shall old engineers be allowed to wear glasses when on duty when glasses are necessary to bring vision up to the accepted standard; I do not say *proper* standard, but "accepted' standard, because no one knows the limits of a "proper" standard for an old engineer. Please observe that I do not recommend the same degree of latitude for firemen that I do for engineers, for obvious reasons. Firemen are usually young men and have not had the experience and do not possess the ripe judgment of engineers; they should, of course, possess perfect eyes before they become firemen, and this same standard, or a very small departure from it, should obtain when their re-examination for promotion as engineer occurs; after they have actually become engineers, they are entitled to the latitude already referred to in this paper. I sometimes feel that the visual requirements of engineers should be graduated from time to time in accordance with their age and years of service on an engine, but this solution of the problem appears to complicate a situation which we are endeavoring to clarify and simplify; it therefore seems best to state what we believe to be the extreme limits of visual safety for old engineers in the requirements, and then trust in the good judgment, and, if I may use the expression, "horse-sense" of the company surgeon or oculist to settle each

individual case on its respective merits without indulging in hair-splitting technicalities.

But to return to the question of the advisability of allowing engineers to wear distance glasses when on duty. My own mind has undergone several revulsions of opinion upon this important question, sometimes believing it best and at other times entertaining different views. I have noticed one thing, however, that my strictest views are in evidence when I look at the subject theoretically, and my most liberal views come to the surface when I am compelled to pass judgment upon an individual case. I believe that no one will contradict the statement that a large proportion of engineers past 55 years of age would fail in a strict visual test for distance, unless they could avail themselves of the assistance of glasses. This means that at the very time when engineers are most valuable to a railroad company, at the very age they may be considered the safest guardians of life and property, they must be discharged, because their vision has fallen one point below a prescribed theoretical standard, and although glasses can perhaps give them perfectly normal vision on both sides, they may not be worn.

I understand all of the arguments against the use of glasses, they become misty on cold and foggy days, sweaty on hot days, speckled with dirt and cinders, and yet when I come to judge upon individual cases, and see in my consulting room a fine looking manly man of perhaps 55 summers, erect in his bearing, with a fine long record for carefulness, skill, reliability and judgment, with no serious accident in his entire career of perhaps thirty years as an engineer for one company, with a family to support, and with absolutely nothing against him except a refractive error that lowers his visual capacity a little below the required standard, and whose vision can be restored to a normal, or nearly normal, standard by the use of glasses, I must say that the temptation is strong, and usually becomes overpowering, to give him the glasses, and tell him to continue in his life's occupation, feeling that a man of this

character can be trusted to take care of his glasses and keep out of trouble. I believe that most gentlemen here present would do the same, and if we have not the courage to live up to certain arbitrary rules, or if we conscientiously believe that such rules are too drastic, why not outline a wise and still liberal policy which we are willing to accept and then live up to it? I question very much whether we have the right to enforce requirements of overpowering character upon old engineers at the present time. No strict requirements were in force years ago when these men were admitted to work for the different roads. They were accepted with but little ceremony, and now they have grown old in the service, and I feel should be dealt with as leniently as is at all consistent with safety. It should, however, teach us that we can hardly be too strict in the admission of *new* men to the service, and I feel that no man should be allowed to commence work on an engine as a fireman (hoping some day to become an engineer) unless he is a practically perfect specimen of physical manhood, for we must remember that as years progress and age advances, physical infirmities become accentuated and the trifling defect of young manhood becomes the disqualifying condition of riper years. It is for this reason that I urge the non-acceptance of new firemen, who, notwithstanding they possess a vision of 20-20 in each eye, yet have an apparent substantial hypermetropia of, let us say, 1½ diopters, which, although easily overcome in young life by an active ciliary muscle, shows itself unmistakably as age advances, and the muscle loses its power, under which circumstances vision drops to a lower and still lower standard until it becomes so poor that the man's occupation may be lost from a cause which, if detected upon the entrance examination would have saved him this bitter disappointment of his advancing years. In other words, in examining a man for his primary entrance to the service, we should look ahead many years.

Another phase of the matter which we cannot afford to ignore is the labor problem, and without dwelling

at length upon the pertinence of this question, I will simply say that in these days of labor unions, when the removal of a single man, even though he is merely taken from one job and given another, is perhaps sufficient to tie up an entire railroad system and paralyze many industries, it may be well to be sure we are on safe grounds when we remove from his engine a superior engineer, even though he is simply shifted from one position to another, to which it is thought his physical defect better adapts him.

I would then recommend, for reasons already given, that the House of Delegates' report be further amended by inserting under "Class A" and also under the caption "Entrance to service or promotion," and after the words "20-20 in each eye, tested separately without glasses," the words "The applicant shall not possess more than 1½ diopters of apparent hypermetropia." *

Under the heading of Class A, and under the caption "Re-examination of those in the service" I would recommend that all of the underlying words be stricken out and the idea of testing with both eyes open be done away with, as being both inaccurate, misleading and unscientific, and the following words substituted:

"Enginemen shall not be retained in their positions if vision sinks below 20-40 in one eye and 20-30 in the other, or 20-20 in one eye and 20-50 in the other. Distance glasses must be worn when on duty provided such glasses are necessary in order to bring vision up to the required standard. Extreme indulgence and concessions shall only be made to old and trusted enginemen, at the discretion of the company surgeon, it being remembered that the best vision is desirable and that glasses are undesirable. Firemen shall not be eligible for promotion to enginemen if vision sinks below 20-20 in either eye without glasses, and shall not be retained as firemen if vision sinks below 20-30 in either eye without

* If the applicant can have a + 1.00 diopter lens placed in front of each eye (separately tested) without blurring his vision, he has one diopter of apparent hypermetropia. If a + 1.25 or a + 1.50 diopter lens does not blur his vision he has more than one diopter of apparent hypermetropia.

glasses. The whispered voice must be heard at not less than 15 feet in a quiet room."

Under the heading of Class B "Re-examination of those in the service" (House of Delegates' report) instead of the words "20-40 with both eyes open, etc." I would suggest the words "Employes shall not be retained in these positions if vision sinks below 20-40 in one eye and 20-30 in the other eye, or 20-20 in one eye and 20-50 in the other. Glasses must be worn if they are necessary to secure adequate vision. The whispered voice must be heard at not less than 10 feet in a quiet room." I would suggest the same words in the same section of both Class C and Class D. I would recommend striking out entirely Section 7 (House of Delegates' report) as the points contained therein have been fully rehearsed before. On this account Section 8 should be called Section 7, Section 9 Section 8, and Section 10 called Section 9.

I dislike exceedingly making these suggestions which have developed into a good many, especially as I have in the past strongly advocated their general adoption. While recognizing their shortcomings, I am confident that as between the two reports the first or original Ophthalmologic Section report is the better, and should not have been tampered with, as it was the deliberate result of the work of a conscientious committee, extending over years, while the House of Delegates' report was the result of the quickly and illy considered debate of a few moments in the House of Delegates, where some little eloquence or personal influence goes a long ways in reaching results. I will, however, gladly support either the original Ophthalnologic Section report or the remodeled House of Delegates' report, as contained in this paper.

I am merely anxious to get some good and commendable movement thoroughly started in railroad circles, some ideas and instructions crystallized, which will be uniform throughout the length and breadth of this land, and be accepted as a standard to work from; after this is accomplished further improvements and advancements

can be made, but we should be careful not to make our recommendations so strict and oppressive that they will be ignored.

Before closing I wish to enter a plea for the more general appointment of eye and ear surgeons on the different roads, and the investing in them of broader responsibilities. I feel confident that if more roads and their general surgeons sought the intimate counsel of skillful and conservative eye and ear surgeons, both as to accidents, examinations, and advice concerning the policy of the road in matters about which they are supposed to be especially interested, it would be better for all parties concerned, or in other words, to use the language of Mr. R. C. Richards, the experienced and efficient General Claim Agent of the Chicago & North Western Railway, "Why would it not be a good plan to spend a small portion of the money that is paid out every year for safety appliances, in getting some *safety employes?*"

92 State St.

DISCUSSION ON THE PAPER OF DR. ALLPORT.

Dr. J. W. Chamberlin of St. Paul, Minn.: When I received a notice of this meeting I learned, for the first time, I was to open this discussion. Not having seen the paper beforehand, or knowing particularly what it would discuss, I am only able to say a few words regarding some thoughts that have come up during the reading of the paper.

The essayist has been engaged in this work for many years, and he has covered the ground very thoroughly and effectually. I can only add a few things that have come to my personal knowledge in the work I have been doing for the past few years in connection with two or three railroad companies in the Northwest.

The essayist takes up the possible percentage of accidents by derailments, collisions, etc., that may result from defective vision. Just how many of these are correctly chargeable to such a defect we will never know, for many

of these accidents result in the death of the engineers, and certainly it will never be known whether it was the result of defective vision on part of the engineers or not. This particular point was brought to my notice very forcibly about a year ago. A young engineer was sent to my office for examination by one of the railroads in the Northwest. I examined him carefully and found his vision was about 20-50 in each eye. I made my report to the assistant general superintendent, thinking nothing more about it, simply telling him that this man was incapacitated for such a position, and that was all there was to it. About three days afterward the superintendent came to my office and said, "Doctor, do you remember Mr. So-and-So that came to you day before yesterday for examination?" I replied, "Yes." "I want to tell you about him, because it will interest you. About two months ago we had a collision on such and such division, which resulted in the loss of one life, and $12,000 or $15,000 for the company. I investigated that case and had a competent man to assist me. We found everything pertaining to that train, with the signals and all that was possible for the safe running of it, were perfect. The signals were right; the brakes were right; the light was all right, and we have been entirely unable to explain why that accident could possibly have occurred. This engineer has been away for sixty days on a leave of absence, and it was the only accident he ever had. I suggested that he had better be examined before taking his position. He had been hauling trains for six years, and I consider him one of our best engineers."

Now, the point I wish to make in relating this circumstance is this: Had that engineer been killed in this accident, the cause of the accident would never have been known, as we may deduce from that certain conclusions, that many accidents perhaps that are entirely unexplained and are unexplainable in any other way are due to defective vision.

Dr. Allport has outlined and emphasized the necessity and importance of carefully examining employes entering the railroad service, and he has dwelt at great length

upon the concessions which should be made to men who have been long in the service, with all of which I most heartily agree. I would be more explicit in determining hypermetropia, because I have had to run against that so often in the handling of old employes, and I have made it an invariable rule that every man who is examined, who has anything to do with the train service, shall be examined in this regard in a way that he does not understand so that he can be tricky. It is just as important a part of the examination as that his visual acuity shall be taken, or color sense. If we proceed along these lines, in a few years we will have eliminated from the train service a class of men who are dangerous, and who are now quite a large percentage of the train operators.

There is one thing that came forcibly to my mind, namely, the locomotive engineer will never admit he can wear out. If a man is 65 or 70, he thinks he is just as good a man for the train service as he ever was in his life, and just as good as any other man, no matter what his age or qualifications may be. To a few of these men, who are intelligent enough to understand and talk to, I have communicated my ideas on this subject. In professional life, when a man gets old, his place has to be taken by somebody else, and is there any more reason why the locomotive engineer should be exempt from the changes which take place with time, and why he, when he begins to act old, should not give way to someone who is younger? While I am heartily in accord with the essayist in making concessions of this kind, and while I do it every week of my life, still there is that one amazing point to me, that the locomotive engineer thinks he can never wear out.

So far as the general adoption of any certain, well-defined rules with the different railroads is concerned, in my opinion the men who are at the head of the examinations are the men who should have that in charge. With the railroads with which I am connected there is no question about my judgment in the matter. The question is referred to me, and I decide it. There is no

superintendent or general manager that says we had better do this way or that way. We must be careful and try not to tread on anybody's toes. I have been waited on by grievance committees from the locomotive engineers and firemen, they asking me to be absolutely fair in my decisions. They have come to me with statements in regard to certain men, saying that this or that man was capable of doing his work as well as anybody, and that he had worked somewhere else and had done certain things. When I have put the question to them fairly and squarely and told them that I could easily demonstrate that the vision of this or that man was not up to the standard, etc., there has not been a single man but who has left my office agreeing that my position in the matter was fair and right.

If each railroad has an ophthalmic surgeon at the head of it, he should familiarize himself with all of these reports, and look into the matter carefully and advise for that road what it should have. He should be familiar with the operation of the same systems or similar ones on other roads; he should consult Dr. Allport's report, and if he is wise he will adopt it, and if he does that he will be working in harmony with others, and when a man comes off from the C., B. & Q. on to the Northern Pacific he connot be employed, if he has been discharged from the Q. road. I have been told by men connected with other systems that we were slow in getting around to that in the Northwest; that the Pennsylvania has done better work in that respect, and that we have been slow about it. I have been told by men from other systems that they could not get employment on the Illinois Central, on the C. & N.-W., or the Pennsylvania, but that when they came to the Great Northern or the Northern Pacific they were almost sure of a position without much questioning. This has resulted in a good many men getting into the service of these roads that could not get in to-day. Those are the men for whom we have to make concessions, as has been outlineed by Dr. Allport. I am glad of the opportunity to have listened to

such an interesting and exhaustive paper. I have read most of the work before, but it is fresh in my mind.

There is one thing that I regard as being almost a necessity which was touched upon by Dr. Jennings in his paper, and that is the identity of the men who are sent to the oculist for re-examination. On the road with which I am connected if a man is dissatisfied with the examination he receives on his division, he is privileged to go to me, or if I am dissatisfied with the report I can order him to be re-examined by myself. I have had it happen on about four different occasions where a man, who was manifestly incompetent, whose vision was bad, came to me with a letter from the superintendent which he never presented, but which was brought to me by someone whom he got to take the examination for him. Of course, when the record of his supposed examination had been passed on by the division to which he applied, if he overdid it, if his vision was altogether at variance with the other one, I have taken pains to inform myself before I completed his examination, and I have never failed to find out just exactly where they were standing. I make it a rule to have every man sent in to me identified by his signature. The superintendent sends me a letter by mail enclosing the signature of this man, and the other man is given a letter which he brings to me. In that way I can detect impositors as they come, and they are "foxy." Some of them are acute about it. I regard that as being an essential feature in connection with these examinations.

Dr. A. H. Andrews of Chicago, Ill.: I want to endorse the paper read. I shall not go into details on the subject, though I desire to mention one thing that was not touched upon in the paper, and that is the necessity for rapid vision. A man may be able to look steadily at a letter and finally name it correctly, whereas if asked to name it quickly he will miss it.

Not long ago I took a ride on the engine of one of the fast trains, and I was impressed with the necessity of an engineer being able to see quickly. If you will test the men who come to you for examination, you will

find that a great many of them, whose vision is slightly defective, are not able to see quickly.

I have seen nothing in print on this subject, but I think all of us should give it more attention. I believe the time will come when we will have tests for rapidity, as well as for acuteness, of vision.

Dr. J. E. Minney of Topeka, Kan.: That is what I alluded to when I spoke about uncertain vision, and I have had occasion more than once to turn a man down because of uncertain or slow vision.

I ought to have said, first, that I am highly pleased with the report of Dr. Allport, and I can only confirm what he has said.

Regarding the watch, I think it is a very poor, uncertain test, and while we use it, yet we use all the other tests, the tuning fork, the voice and whisper in connection with it, and many cases pass our examination who cannot hear the tick of a watch 5 or 6 inches; that is, old employes, not the new ones. You will find, I think, the watch is one of the least reliable tests that we have, and yet some place great stress upon it.

Respecting the old employe, I see some here whose hairs are getting gray as well as my own, and we feel that there is a liability of a mistake being made through sympathy, yet we must trust to judgment. Eighteen years ago, when I was first appointed on the Santa Fe Railroad, I asked the chief surgeon this question: Shall I consider in my examination of these older men the record of that engineer; that is, whether he has had accidents, how many, etc.? Shall I consider his intelligence, although he may be up to the standard, etc.? He replied, "Yes, if they come up to the standard, but use your own judgment," and I have done so from the beginning and have had no occasion to regret it.

Just as I left Topeka yesterday I met an old engineer, 66 years of age, who has one of the best records on the Santa Fe system. He runs from Topeka to Atchison. The train was forty minutes late. He said to me, "We are late, and they expect me to make up the time on the road; I know where the bad places are; I won't

do it." And when I said to him, "Are you not afraid of being discharged?" he replied, "No; I am doing my duty." He is at work and has had fewer accidents than the young men. The intelligence, the experience and record of that individual should be considered, and yet we are liable to overstep the bounds because of our sympathy.

Respecting the whisper, we make it a rule that applicants must hear a whisper 20 feet distant with the lips of the examiner from the patient. I think the point should be remembered not to look at the patient, but have him look at you (the examiner), and whisper to him, and see if he can hear you at that distance. The lips of the examiner should be from the patient, and he to hear the ordinary whisper, at least 20 feet. That is the method that we should resort to in making the examination, with one ear closed, the patient standing sidewise to you.

I think the ophthalmoscope can be used with advantage in examining those individuals that are about to be employed. Of course, if you cannot use the ophthalmoscope, the essayist has spoken of a method that may be used. But the ophthalmoscope is of great value in these cases. Often we are able to determine a high degree of hyperopia, and either exclude a man or have him come back for a re-examination.

One word concerning the old engineer. Those of you who have been in practice for ten or fifteen years, from your own experience, know very well how it compares with when you first began the practice of medicine. A patient comes to you, and you try to find out what is the matter with him, and how many times have you been mistaken? Now, this work you can do more rapidly, accurately, definitely and to a certainty. It is the same way with the old engineer, and that is why I make a plea for him in that respect.

Dr. Chamberlin: As the report of Dr. Fairchild bears on this same subject, would it not be well to have it read, and then the discussion continued on both the paper of Dr. Allport and this report?

There being no objection to this, Dr. D. S. Fairchild then presented the report of the Committee in Regard to the Examination of Railway Employes.

Dr. John E. Owens of Chicago: It is a very difficult matter for me, at least, to discuss the merits of Dr. Allport's paper and the report that has been submitted by Dr. Fairchild. The paper of Dr. Allport is a comprehensive and valuable one for all of those who are interested in this work. I cannot discuss the report handed in by the Committee of the Academy because I do not remember the details. I cannot carry them in mind. I suppose that many of you know the railroad companies themselves have taken up the matter of uniformity of requirements for railroad service; I mean some of the chief officers of the railroads, who are not professional men, and a copy of their report I have just received from a member of the committee, but I have not had time to look it over.

We have been considering for some little time a more liberal requirement on the Northwestern Railroad in cases of old employes, but have not yet reached a decision. I thought I would wait until I had the report of the Academy's committee, also Dr. Allport's paper, and I am not yet able to say just what I shall do in the matter. It seems to me, however, it is a subject for proper consideration by those who are interested in this work. We should have printed copies of both these reports and quite a number of them, so that we can be brought face to face with the matter, and more intelligently consider its merits and decide what we ought to do. It is one of the most important subjects that has ever come before the Academy, and deserves much more consideration than we can give it here to-day.

Dr. J. E. Minney of Topeka, Kan.: I think these reports are a good working basis for us, and if we wait until we have everything correct, we will never have a report made. I am certainly in favor of having these reports printed, and let us use them as a working basis.

I want to switch off for a moment, to speak of an interesting case that came up for examination about two years ago to me. It was the case of an engineer who

had an accident. His eyesight was perfect, each eye was 20-20; everything appeared to be normal, yet he had an accident and was sent to me for examination. I took him into my examining room, lit a lamp, and put a prism over his eye. After testing him a little while I said, "You have double vision." He said, "How did you find it out?" I replied, "We oculists know how to find it out." It turned out that this man had double vision only when he was tired or overworked. He had been overworked, and he admitted, after it was found out, that he had double vision when he became very tired. This is an important matter, and it is the exceptional cases we want to consider. I am in favor of the reports of these committees being published and sent out to us as a working basis.

Dr. A. B. Brumbaugh of Huntingdon, Pa.: I recall the case of an engineer who, in approaching a light, said it was green, while the fireman said it was red, and while they were discussing the matter both had to jump for their lives, there being forty-two cars piled up with freight. I would like to ask Dr. Minney if that is due to double vision or to a tired condition of the eye.

Dr. Minney: They were deceived by the color.

Dr. Frank Allport: We have with us one of the most experienced gentlemen in the United States in regard to these matters—Mr. R. C. Richards, of the Chicago and Northwestern Railroad Company.

Mr. R. C. Richards (general claim agent, C. and N.-W. Ry.) of Chicago: I have had some experience in relation to the matter of examination of employes, because I believe the Northwestern was one of the first roads to undertake these examinations in a systematic way. Unfortunately, I did not get here this afternoon until the greater part of Dr. Allport's interesting paper was read. I only heard the last part of it, and I did not get the benefit of the first part of it.

This matter you have under discussion is the most important that has ever come before the Academy. I think it is more important to the railroad that they have good men who can see and hear than to have a good track and equipment. If you have good men, you can

get along pretty well with a poor equipment, but if you have poor men you are always in trouble.

The American Railway Association, composed of the managing officers of the United States and Canada, have had this subject under discussion. The report was sent to me some time ago, and the question that has come before that association, and will be finally decided by the railroads, is the very one you are now discussing, that is: "What is the very least normal vision, hearing, and color sense that it is safe for the railroads to employ?" I think, if you do not do anything else at this meeting than to adopt this report which is founded on theory as well as practice, one which can be followed by the railroads, you will be doing a great thing for the railroads and for the country, and I do not believe you can give too much time to the discussion of this matter so as to get it right, so that when your recommendation comes to the American Railway Association, it will in all probability be adopted. Of course, we all know that railroads are paying higher wages for this class of work than any other industry or concern in the country; therefore, they are entitled to the highest degree of intelligence and physical ability. I do not think you should let the bars down. If there is going to be any change at all, you should raise them, because we all know that ordinarily, when these things come up for final decision, there must be some compromise, and you had better have a little room to trade on. The more you consider this matter, the more important you will find it to be, and the more necessary it will be to have these instructions and recommendations made right. Considering what little I heard of them, it does not seem to me you have got them too high. You must have the standard high. If you will put this matter in such shape, so that it will not have to go over until some other meeting; if you will adopt it in some form, even though you postpone it until to-morrow, you will be doing what I consider the proper thing.

Dr. Frank Allport: I want to say a few words regarding the report brought in by Dr. Fairchild. As I understand the report, there is nothing said with regard

to color blindness, or as regards excluding men who are color blind. This report has been made somewhat on the basis of the report of the House of Delegates of the American Medical Association, and that report, as I pointed out in my paper, while it mentions color blindness, it says certain tests should be used in color blindness; it does not say men shall be excluded who are color blind. Is that right?

Dr. Fairchild: We assume that all men who are color blind are excluded.

Dr. Allport: Should you assume it, or should it be put in plain language?

Dr. Fairchild: The preliminary report here requires that a man shall have normal color vision. I take it for granted that there is no exception to that proposition, but it is simply a question of visual capacity.

Dr. Allport: Another thing Dr. Fairchild speaks of is with regard to old employes having 20-30 vision with both eyes singly, and they shall be allowed to wear glasses to bring vision up to the proper standard. In my experience, I find a great many old engineers whose vision can be brought up to 20-30 in one eye, but they cannot get any better than 20-40 in the other eye. While we wish to raise the standard, it seems rather a hardship to fix vision at 20-30. If a man does not have 20-40 in one eye he should be excluded; it would be better and it would meet the approbation of railroad officials if they understood the matter in a higher degree, if we give them latitude, one eye being better than the other, vision in one eye being 20-30, in the other 20-40.

Dr. Owens: What would be the reduction?

Dr. Allport: I don't think there would be any appreciable effect on the acuity of vision.

Dr. Owens: I have been informed, and have understood, that after long runs on fast trains, visual power of engineers becomes somewhat reduced temporarily.

Dr. Allport: That, I presume, is true to a certain degree; but I think vision, as ascertained in the office, should stand without regard of some possible physical fatigue after taking a run.

In the report presented by Dr. Fairchild nothing was

said, I believe, about hypermetropia. Those of us who are dealing with various forms of defective vision and correcting them by glasses feel the importance of that point. You find that always mentioned by men who devote special attention to the diseases of the eye. It does not appear to the ordinary railroad surgeon that a man who may have vision of 20-20 is admitted, and nevertheless have hypermetropia of ½ D., which, as he gets older, the strength of the ciliary muscle cannot overcome. Shall we exclude such men from advancement in the service? There are a number of points, it seems to me, which should be considered, and acting upon the suggestion of Mr. Richards, which I think is most pertinent, if this academy does not do anything more than to adopt this report, it will have accomplished a great mission, and I would therefore suggest that this committee be continued until to-morrow, so that the members can consider carefully the various reports before acting quickly and harmonize any discrepancies that may exist, and bring in a report to-morrow. I would make that as a motion, that the committee be continued, and requested to bring in a perfected report to-morrow.

Dr. H. C. Fairbrother of East St. Louis, Ill.: It occurred to me in listening to the report that if it was defective in any particular, it was not sufficiently explicit in regard to hearing, distance vision and color vision. A man may hear the tick of a watch at 36 inches with one ear, but only at ten inches with the other. This ought to be considered in the report, and whether we should turn down such a man or not. The same applies with regard to distance vision. A man may have normal distance vision, reading 20-20 easily, 20-15, or 20-30, with one eye, but not with the other. Shall we turn down such a man? Again, shall we shade at all the matter of color perception? The report ought to touch on color defect as distinguished from color blindness. Color ignorance also is important.

Dr. Owens: This matter of whispering is not very clearly understood. I believe in Dr. Allport's paper he mentioned hearing a whisper at 10 feet. In our examinations on the Northwestern and the Illinois Central

I have been subjecting applicants to a coarse whisper at 20 feet, or ordinary conversation. I discussed this matter with Dr. Allport a year or two ago, because the ordinary conversation of a large, big-chested man is different from the ordinary conversation of a man of smaller size. And so in some cases an ordinary conversation may not be much better than the watch. We have to depend upon the size of the watch entirely. I more frequently rely on a coarse whisper at 10 feet; if it is to be a low whisper, the patient or applicant would not be expected to hear it. What kind of whisper should the committee consider?

Dr. R. Harvey Reed of Rock Springs, Wyo.: Dr. Owens has tacked on a very important factor in this matter. Whispering is an abstract thing. Just as Dr. Owens has said, a man with a large chest, with good, heavy vocal cords, can whisper so as to be heard across a room, while the whisper of another man may not be heard more than 5 feet away. It strikes me, there ought to some mechanical appliance, something that can be brought down to a certain tone by scientific principles, and each railroad supply its surgeons with such a device, so that the tone would be the same for each person. The idea of leaving the matter of a whisper to a man who is examining another man seems to me absurd, and while it is used at the present time, I do not think it is the highest form of examination we could adopt. If we are going to adopt something, it should be alike to all as far as science can get at.

Mr. Richards: Permit me to say, I do not think the fee ordinarily paid for these examinations is sufficient. You, gentlemen, when you make your reports, ought to have a reasonable fee for making proper examinations. That is a matter which ought to receive consideration.

Dr. Chamberlin: Apropos of the remarks of Dr. Reed, I will say that there is a little device with which some of you may be familiar—the acoumeter. I have used it for making tests, as have others. These acoumeters can be made substantially the same, so that it would be impossible to detect variation in the volume, tone or pitch,

or anything else. It could be used at different points where examinations are made with a certainty that the watch cannot be used. We have abandoned the watch altogether. Watches vary in ticks and in intensity; but the acoumeter in my opinion is very accurate.

Dr. Allport: I move that the committee bring in a perfected report to-morrow. Seconded.

Dr. Owens: Might it not be well to add Dr. Allport to the committee, so that the two reports may be considered together? I make that as an amendment to the motion. Seconded.

The motion as amended was put and carried.

Dr. Fairchild read the report of the committee, at the conclusion of the reading of which Dr. Owens moved that it be adopted. Seconded.

Dr. Evan O'Neill Kane of Kane, Pa.: I wish to speak briefly of one disqualification, that of chronic alcoholism. The reliability of an employe is so seriously impaired, with a tendency to defective hearing, eyesight, and many other physical conditions, by the use of alcohol, that there ought to be instituted a most careful test to ascertain whether a railroad employe is a user of alcohol in any form, and all young men who are found to use it should be excluded from the service.

Dr. A. H. Andrews of Chicago: After this report is adopted it cannot be modified, and, it seems to me, before it is adopted there ought to be more stringent regulations regarding the hearing test. A loud whisper at 10 to 15 feet is all that I was able to gather from the report during its reading. Is that correct?

Dr. Fairchild: Twenty feet for new employes, and 10 or 15 for old, and the patient standing sideways.

Dr. Andrews: A loud whisper is an unlimited whisper. If we had a room one hundred yards long a loud whisper might be heard at the end of it. That feature is not sufficiently strong in the report. No matter what other restrictions are adopted the loud whisper test in my judgment is not sufficient. I think a great many here will agree with me.

The President: Do you want a different test?

Dr. Andrews: There ought to be additional tests and

some regulations should be made regarding the character of the whisper which shall be used. A whisper, when the lungs are almost empty, will be found nearly uniform by all persons, but with the lungs full there is as much difference in the whisper as there is in the voice. I know it is hard to formulate a report that will stand the test of years which we hope this report will do. The sympathies of the surgeon usually are with the employe, and he will naturally whisper loud enough for him to hear.

Another point: In many of these cases each eye ought to be tested separately for color perfection. It has never been thoroughly established where the defect lies, whether in the brain or in the eye. The defect is certainly in the eye in some cases, because I have found men who were color blind in one eye, and not in the other. If we test each eye for acuity of vision we ought to do the same regarding color perception.

Dr. J. F. Pritchard of Manitowoc, Wis.: That question is settled. In the first place, you must leave something to the examiner. The personal equation is very important, and I have borne that in mind in appointing examiners. We should see that the examiners are properly qualified to do this work.

Dr. R. Harvey Reed of Rock Springs, Wyo.: I am absolutely opposed to leaving the test of hearing to a whisper. Much as I appreciate the work of Dr. Fairchild and of other members of the committee, I think the whisper test is unfair. I want to see a fair test given to the employe, and I want to see a fair test given to the employer, because if our trains are going to be run by parties tested under these rules, then I want a test that is fair to all, and I do not think there is any test we can use that is fairer than a mechanical test which will give the same sound to everybody. I am not prepared to say what kind of a test we shall have; but, it seems to me, a tone-bell or key struck at a certain distance, with a certain power applied to it, would be much better than a whisper. It is impossible for us, I think, from a practical standpoint, to depend upon a whisper. You can range a whisper high or low, as you desire. There is

no getting around that, and if it is used there is always a question of doubt in the mind of the party who is examined.

Dr. H. C. Fairbrother of East St. Louis, Ill.: When we realize that this report is going out as an expression of this body to the railroad companies for their adoption, we cannot overestimate its importance. On that account, it seems to me, we want more time to digest it. We cannot enter into it in detail now, we have not time to take up the report in sections and approve or disapprove of them. There are a dozen railroads coming into my town which are contemplating the adoption of something of this kind. I would like anything emanating from this academy to be well considered, so that we will not have to take it up afterwards. There are one or two things, therefore, with regard to this report that I wish to refer to:

In the first place, I think the report states that these examinations should be made by oculists, when this can be done. This would involve two examinations. It is impracticable. I would not be in favor of that part of the report.

It is stated that all applicants for train service shall have normal hearing. Hearing a whisper at 20 feet is said to be normal hearing, but it is not in each ear. If the report contained that, it would be clear. A man may hear a whisper at 20 feet with one ear, and be deaf in the other.

Distant vision is said to be normal at 20 feet in each eye. Some of the best applicants see 15 feet with one eye, or 12 feet; but if there is some latitude given to the judgment of the examiner, it is all right. The same thing applies to color perception. This report is defective in that respect. It says they shall have normal color perception, but the report does not specify what that is. There are shades of color perception. The report does not define these. If a man is color blind, he is color blind in both eyes; if he is color blind in one eye, this report does not state whether he is disqualified or not.

Dr. John E. Minney of Topeka, Kan.: I move, in addition to the examination required by whispering, we

use a minimum and maximum whisper; in addition to that, we use the tuning fork, voice, and watch by continuity, and that the whisper in each ear shall be heard 20 feet away.

Seconded by Dr. Reed.

Dr. John E. Owens: I would not accept that amendment because it would involve a multiplicity of methods. It would consume time without bringing us to any useful result. I cannot whisper well without any air in my lungs, or, as Dr. Andrews has said, when the lungs are empty. I do not think we ought to make that the measure of a maximum whisper; I think we ought to give a coarse whisper. That is the way we express it in our regulations, and I caught the word from Dr. Allport. If a man, stationed at 20 feet, can hear a coarse whisper at that distance, he is all right in that particular.

As to the use of the tuning fork, I fully appreciate what was said about it, but not being familiar with its use, I would not like to advise it or oppose it. I would like to know more about it. I believe from what has been said it is a most useful instrument.

The little mechanical apparatus devised by Dr. Williams of the Burlington road—the acoumeter—I have used considerably. I think much of it. A man with what we understand to be average hearing ought to hear this instrument at 20 feet. I do not think we ought to multiply our methods of examination. In a coarse whisper or ordinary conversation, say to the applicant—"How old are you? Are you married?" He ought to hear that at 20 feet.

Dr. R. Harvey Reed: The test ought to be based on some mechanical apparatus, that will bring it down to a system. Everyone should have the same test. For example, you have a tuning fork, you have a mechanical spring that will strike the tuning fork; with muffled hammer you can test it. That can be heard at 10 or 20 feet, according to the amount of pressure you put on it. That is entirely different from the voice. I think the voice is or should be ruled out of this question if we want a fair test, because there are not three of us in this hall who

will whisper the same, whose tone of voice is the same. The employe as well as the employer should have a fair test in this matter, because it is an important subject. The test should be just as fair with regard to vision. If a man sees a card at a certain distance, that settles the question. But when you come to the ear, how do you whisper? You whisper loud or low, according to the volume of your voice, so that you may think you are doing what is right. I think a mechanical appliance should be mentioned in a report of this kind. We want to go before the railroad managers of the country with something as near definite as possible. We want to arrive at a mechanical, and not at an approximate, idea, consequently I object to that part of the report.

Dr. Frank Allport: We want to recommend something that is accurate and scientific; at the same time we want to go before the railroads recommending something that is practical. I have no objection to mechanical devices. I think they are very good things. Of all the mechanical devices, if we recommend anything, the acoumeter is probably the best. Now, how much hearing is actually necessary for an engineer in prescribing his duties as such? Understand me, I am not belittling the importance of hearing. When it comes to hearing it amounts to very little. When a man is on his engine he can not hear much anyway. It is impossible for a fireman and the engineer to converse very much, and there is nothing that is more practical and better than the whisper voice. We should depend somewhat upon the intelligence of the examiner. I see no reason why we should have any test except the whispered voice. Certainly, the watch is obsolete in these tests, and as regards the more important fact of good, practical hearing, the voice is all that is necessary. Of course, we oculists and aurists are able to detect varieties of hearing, the low and high pitch. We use in making diagnoses various pitch tuning forks to ascertain variety. But as practical railroad examiners we have nothing to do with these things, and I believe that the whispered voice, as outlined by the committee report, is all that is necessary. I would, however, earnestly recommend

that the same test be applied to both ears. I understand that was not incorporated in the report. I would recommend that if any mechanical device is to be recommended by the committee, that the acoumeter be used, as it is the best and the most practical instrument we have.

(Here Dr. Pritchard called for the question, namely, the amendment to the original motion. The amendment of Dr. Minney was put and declared lost. The original motion made by Dr. Owens to adopt the report of the committee was carried.)

PHYSICAL EXAMINATION OF RAILWAY EMPLOYES.

BY H. R. JENNINGS, M. D., OF COUNCIL BLUFFS, IOWA.

The physical examination of railway employes is an important necessity if the company is to have competent men in its employ. The surgeon making these examinations has a responsible duty to perform for the company. He is under an obligation to do this work in a painstaking, careful and conscientious manner, and give the company, and not the prospective employe, the benefit of any doubt that may exist in his mind as to the qualifications of the applicant. There should be none but first-class men filling the responsible positions where life and property depend upon their actions.

It is not many years since that there were many men in the railway service who were physically incompetent. The use of alcoholic stimulants was by no means uncommon. Such is not the case at the present time, however. These men while on duty are responsible for the lives of people and large property interests. They should be able to act quickly, with good judgment, and always have a healthy and active brain. So long as the possibility of human error enters into the operation of railways, so long will occasional avoidable accidents occur, and the infrequency of their occurrence will be in direct ratio to the competency of the employes.

The courts are constantly holding the railway companies liable for the accidents which occur, and there seems to be a growing tendency to place the responsibility in all cases with the company. As a consequence they are called upon to pay large sums for damages sustained. The companies are obliged to recognize this legal responsibility and also the moral responsibility imposed upon them in the care of their passengers.

The physical defects in an employe may be and

frequently are a menace to the company, because of hereditary or acquired disease which predisposes him to complications or prolonged recovery, in case he meets with some accident, the nature of which under ordinary circumstances would not be serious. The company is held legally responsible for his disability, which may be complete and involve the payment of large damages, when in fact had he been a healthy individual the injury would have resulted in early and complete recovery. It is not only necessary that he be able to do the work which his position requires at this time, but he should be one who will be likely to continue an active and competent employe for many years to come, that his services may become more valuable, instead of less so, and not require that he put in a large part of time off duty.

There is a similarity in the examinations and requirements of the different companies. Such must necessarily be the case. It has some advantages in establishing a sort of uniform standard, more or less general, to which the men must conform. The examining surgeon will, however, frequently find that men who have been previously examined for other companies are somewhat expert in hiding their deficiencies. From this fact would arise the question whether a uniform examination would be advantageous or desirable. When an applicant presents himself for examination the surgeon should satisfy himself of the identity of the man. An applicant might get some friend to take the examination for him, the friend probably has passed the examination at some other point. The signature of the applicant signed in presence of the surgeon and compared with his signature made in the presence of his foreman would be a check on his identity. The surgeon should be sure of the identity in all cases before making the examination. It would seem that the signature alone is not sufficient in way of identification to cover all cases.

It is customary for the work required of the man in the position he seeks to fill to modify the character of the examination. Men in the train service are usually required to be in all respects first-class physical specimens,

or in other words normal, their positions being decidedly responsible ones. In case of those in less responsible positions, much more latitude as to physical perfection is given.

There are men who are physically first class, and yet so mentally constituted that they should be disqualified. It is not necessary that they be unsound mentally. One who is sluggish and slow to comprehend, hesitating in actions and lacking in judgment, should not be considered fit for service. There are no rules or means by which one can always form an opinion in such cases without possibility of error. To measure in an accurate manner a man's mental qualifications is almost out of the question. Yet should he be noticeably slow of comprehension and undecided in his judgment, he would probably be so at a time requiring decided and immediate action, when faced with an emergency, and ought not to be recommended for employment.

The use of alcoholic stimulants and narcotic drugs entirely unfits a man for a position of trust. An applicant seeking employment will usually deny that he uses them. If the examining surgeon has any suspicions as to the accuracy of the statements, he should always, if possible, by inquiring satisfy himself as to the truthfulness of the statements, and not recommend for employment a man who may by their use be the cause of a serious accident to others or himself.

The personal history of the applicant is important as to the diseases he has had or may have hereditary tendencies to, not alone because they may disqualify him for the service he seeks by his being unable to do the work, but because of the fact that an insignificant injury he might sustain might light up some latent morbid process in his system, which would prove serious. Among such may be enumerated:

Tuberculosis (and this may be a latent condition or a pronounced hereditary tendency); rheumatism (if there have been several attacks); syphilis (if there are recent indications of infection or symptoms of secondary or tertiary form); and gonorrhea, if present at time of

examination. Among other diseases that would disqualify are: Contagious skin diseases and those of unsightly nature, if the position sought is one in which the applicant is obliged to meet the public in discharge of his duty; organic or functional diseases of the heart; epilepsy or attacks of partial or complete loss of consciousness from any cause; sufferers from frequent and severe headache; attacks of pain from any cause which will take the mind from the work; neuralgia, etc.; insomnia; diseases of the nervous system; pronounced varicose veins; varicocele, if of any considerable size; hemorrhoids, if large or painful or likely to become so; fistula; hydrocele, if of any size; hernia; past injury causing the loss of such a portion of the hand as to seriously interfere with its practical use; the loss of an entire thumb would be a serious loss, or the loss of parts of several fingers or more than one whole finger; injury to the arm which would involve the usefulness of the free motion of wrist, elbow or shoulder joint; the loss of enough of a foot to cause a decided limp and interfere with easy and rapid locomotion; any injury to the trunk which is sufficiently severe to in any way interfere with the functions of the contained organs. Any injury to the head should require careful examination, and questioning for symptoms of brain lesions. Most applicants who have ever been vaccinated will claim a recent vaccination. A good mark should always be required or revaccination done at time of examination.

For new men or men promoted in train service, it is justly usual to require normal vision in both eyes, glasses not being allowed.

It is usually stated that color blindness to some degree is found in from 2 to 4 per cent of all cases. This is not true in men presenting themselves for examination. A large percentage of men who apply for a position and come to the examining surgeon are men who have been in the service of some other company and have left the employ for some reason other than physical defects. Because of this fact it is rather unusual to find color blindness, and where found it is almost always in men who

are entirely new to the railway service. The man who can pass the examination with worsteds is usually considered safe. In the green the sample color is of such a light shade that some men are at first at a loss where to place it, and I have seen men who at first got the idea that they were to pick out the lighter shades of the confusing colors and proceed in that way, and when asked if they were getting all of the same color say, no, they were after the lighter shades, and when told to confine their efforts to picking out all shades of one color they would proceed to get the entire set of green without hesitation. Some are misled in naming the color by thinking if necessary to name the shade. They will, for instance, say it is a greenish gray, and then by leaving the matter of shades out of the question will leave off the greenish and they are badly confused. Others may call it a grayish green, and if they eliminate the grayish from their consideration, they proceed without trouble. These cases are those of ignorance, and the surgeon need not make it leading or suggestive to find this out, yet it frequently requires much patience and time to ascertain this fact, which would not be the case if the sample color was a little more pronounced—not necessarily by any means a switch light green. Color ignorance and color blindness need not be confounded.

The tick of the watch to ascertain the acuteness of hearing is somewhat variable, as some watches tick much louder than others. I always use the same watch and know how far an ordinary normal ear should hear it. This test, as I understand its value, is due to the fact that if the watch tick cannot be heard at near normal distance it suggests the presence of disease of the internal ear. In these cases the voice or whisper may be heard normally, if voice is pitched high or low according to the case, some being able to hear the high and others the low pitch, but both, of course, are defective.

After an employe has sustained an injury to the head, before being allowed to resume his work, I think he should always be re-examined. While it would increase the liability of the company to the employe, if any

existed, it would in the end probably limit liability by preventing an incompetent man occupying a responsible position. Head injuries are more often than is recognized the cause of defective vision and hearing.

I have no desire to offer or suggest to the chief surgeons any sort of a set of questions for an examination blank. As a matter of fact, the printed questions on any blank should be only a part of the examination. Much more should be expected of the examining surgeon than the simple routine of answering the printed questions. When the surgeon recommends a man for service, and says he is a normal or first-class man, it should only be after he has thoroughly satisfied himself that such is the case. The fewer men who make these examinations consistent with the needs of the service would be an advantage. The more examinations a surgeon makes the more ought he to be impressed with importance of the services rendered.

DISCUSSION.

Dr. H. Reineking of Milwaukee, Wis.: This is a line of work in which I have had but little experience, and so far as Dr. Jennings' paper is concerned, I think it is a good one, and I endorse everything he has said. I yield the floor to those who have had more experience than myself for the further discussion of the subject.

Dr. John E. Owens of Chicago: The general make-up of the applicant should be considered in addition to examining special regions, like the eye and ear, for defects. The two railroads with which I am connected disqualify men who show evidences of chronic alcoholism. We find a great many men with frequent pulse in our examinations, and we are at a loss to account for it. Not infrequently we find a man who has a pulse which ranges from 140 to 145, and in justice to that man we have him come time after time, and on each occasion the pulse will range from 125 to 140. Sometimes the finger is stained from cigarettes: in other cases this cannot be assigned as a cause; yet in the whole make-up of patients in some cases we have not been able to find anything to account for it. At the same time, we feel like ex-

cluding such men from the service with this cardiac irritability. Some of the men have never had rheumatism, and according to their own stories, they have never had any disease that would be worth considering in such connection, and we have had to let some of these men go. Almost invariably they would say their pulse at home would be about 78, and yet when we examined them, we found it 140. Many of these cases puzzle us as to the cause. I shall be glad to be enlightened by some of the gentlemen present on that one point.

Dr. L. Sexton of New Orleans, La.: When a man comes up for a test, it excites or increases his heart beat, and I think it is a safe rule to take his heart beat when he is sitting down, as there is a difference of eight or ten beats. I examine the heart before I make an examination of the man, because if you have called him out and have worked him up and he has missed a few of the Snellen type, he is afraid that he won't pass.

Dr. John E. Owens: In some of these cases Dr. Walter H. Allport has made the examinations and has found men perfectly fit for the services which they seek, excepting in the particular I have referred to. We say to these men, "There is no use in being nervous or excited," and still there is a great acceleration of the pulse.

Dr. John E. Minney of Topeka, Kan.: I am very glad to have heard this paper. It has impressed one thing particularly on my mind, and that is the identity of the employe. I think that was an excellent point, and one to my mind that has not been touched on. The second point is the intelligence of the man, which, I presume, we all consider, and one worth dwelling on.

Respecting normal vision, we find men who may have normal vision, and yet, if we were to place 1½ or 2 glass on the eye which needs 18 or 20 glass, and he reads 20-20 with that glass on, that man, if he is permitted to pass, should be called up at last in a year or two for re-examination, for it shows that he is probably hyperopic, and distant vision will soon begin to fail him.

Another point is the uncertainty of the eye. We find

men who are able to read 20-20, but they are uncertain. They will miss certain letters, and when a further and more careful examination is made, we find that those men are unfit because of their uncertain vision.

As has been intimated, the first examination should be a rigid one, very careful indeed.

I do not know whether this other point I speak of will be of much interest to you, but I would like to know the percentage of the surgeons who require in connection with these examinations calisthenics, whether they examine the patients in that way. For example, have them put their feet together, touch the ends of the fingers to the floor without bending the knees; or have them go through arm and leg motions, striking the hip with the heel; also separating the legs, placing the arms akimbo, and trying the suppleness of the spine, etc. While this is not required in our examinations, we do it in our street-car examinations, and, as a precautionary measure we require men to go through calisthenic exercises.

Respecting the acceleration of pulse, that has troubled me quite a little, yet I find in the main that Dr. Sexton's explanation is, as a rule, correct. When they come up for examination, they are excited, and of course the pulse is increased.

Dr. William E. Guthrie of Bloomington, Ill.: I came here to-day expecting to obtain a good deal of information from this one paper and the discussion on it. I am not yet satisfied. I would like to hear more from Dr. Owens and gentlemen who have had a large experience in the examination of railroad employes. For two years I have had considerable of it to do, averaging 75 or 85 examinations a month. I am just far enough into the work to know very little about it; hence I am anxious to hear the results of men of larger experience in this work.

There is one thing I desire to call attention to, namely, how much attention should we pay to gonorrheal threads in the urine, indicating some prostatic or vesical disease, or some disease of the vas deferens? Many of these people who are injured a trifle have backache afterward,

and I am satisfied many of these backaches are the result of some defect in the generative organs. Many of the men who have copious or a large quantity of gonorrheal threads in the urine are undoubtedly unfit for service. I would like to know what others think of such men, and how much stress should be placed on the condition of the urine in these examinations for employment. I would like to know how much of the hand or foot may be lost before a man is unfitted for his work or for employment.

I have noticed this nervousness referred to by Dr. Owens. We know that many of these men appear for examination after traveling long distances; they are tired, and they come with rapid pulse, sometimes accompanied with elevation of temperature. I find a great many of them, after administering a brisk laxative, followed with a night's rest, come back the next morning feeling much better. There are others whose pulses are rapid and continue to be so, and they say it is excitement. If a man has a nervous system which is excitable enough to make his pulse rapid when he comes up for examination, he is unfitted for emergencies in the railway service, and should be rejected for that reason, if for no other.

When I first began this work I rejected men for varicocele. I had a talk with Dr. Owens shortly afterwards, and he told me that he did not reject them for varicocele, or very rarely did so. I have been more lenient since then.

I would like to know how much stress we should lay on varicose veins of the legs. I have been in the habit of rejecting men who had varicose veins of the legs. All of these things we ought to know more about from those who have had a larger experience than myself.

Dr. H. C. Fairbrother of East St. Louis, Ill.: In answer to the questions asked by Dr. Guthrie with reference to urinalysis, I believe the Chicago & Alton Railroad Company is the only one that requires urinalysis, and that I understand to mean nothing more than a chemical, not microscopic, examination.

With reference to the paper of Dr. Jennings as to the percentage of color blindness, probably one per cent of the applicants affected with color blindness will cover all examinations. A little less than that is reported to the Illinois Central, about ¾ of one per cent. This is accounted for on the ground that there are some color blind who do not come for examination on account of it, and once in a while a man comes who wants an examination, and if he is found to be color blind, he does not want to go on with a further examination. Such a man I let off. The value of this physical examination is open, is unmistakable, as shown by the improved personnel of the employes of the roads that require good examinations, like the Illinois Central, compared with the men working in the same yards of other companies beside them.

As to normal hearing, a man may not hear as well with one ear as with the other. He may be quite deaf in one ear, while hearing in the other is very acute. One ear is the substitute for the other. It is complementary. Normal hearing is hearing at 20 feet ordinary conversation. One may hear the tick of a watch distinctly in a quiet room at a certain distance. In the night the tick of a watch can be heard at a greater distance than it can during the daytime. In the daytime the tick of a watch is heard at variable distances. Then, too, watches vary materially in ticking.

Dr. R. Harvey Reed of Rock Springs, Wyo.: There are one or two points I wish to call attention to, one of which was brought out by the last speaker, as to the tick of a watch. Go to the top of Pike's Peak, and fire off a 44-caliber revolver, and it will scarcely be heard, because of the high altitude and because of the rarefied air.

As to the examination of the ear, in lower and higher altitudes, I am 6,662 feet above sea level, and there is a difference as to the ability of a person to hear a watch at a certain distance. There is a difference in hearing in a lower altitude.

A word or two with reference to color blindness. It

is customary, and, I believe, advocated by the best roads and best surgeons, to examine with one test. I do not think myself it is really a fair test of what you want to attain. In the first place, what does the railway man deal with? He deals with red, white and green flags at a certain distance. In my experience, in testing men for color blindness, I take them out on the track and say to them, What is that switch light—is it red, green or white? This is done at a greater distance than if they are tested by a woolen yarn, and if they are able to distinguish between these colors, they are competent men to go on the railroad. If it is a red, white or green, as the case may be, let the man tell what it is. I do not think testing them with woolen yarns is fair. This is a fair test if you want men to become experts in dry goods stores, but not for railway employes, who know nothing about the different colors and shades.

Dr. John F. Pritchard of Manitowoc, Wis.: With reference to the remarks just made by Dr. Reed, I have tested men with yarns and with lights, and I never yet found a man who could not pick out the yarns who could pick out the lights. If a man is color blind, he will take the intensity of the color, and call a bright light red, and a dim or dull light, green.

Dr. Frank Allport of Chicago: I have no desire to prolong this discussion, but when I hear my friend make a statement of that kind, I cannot help but get on my feet. I beg leave to differ emphatically with the gentleman, and I venture to say that a test of that kind would be absolutely discredited in any textbook on the subject whatsoever. It is absolutely unreliable. The fact that a man can tell a color has nothing whatever to do with his being color blind. Strange as it may appear, a man who can see red or green may not be absolutely color blind, because absolute color blindness means absolute elimination of all color, so that all of these things look black and white. A landscape of green trees, poppies and flowers, would look simply like a black and white picture. There is no discrimination whatever as to color in a person who is absolutely blind. Cases of this kind are ex-

tremely rare. But a person may be able to discriminate as to a color; he may be able to detect a red signal for years and never get into trouble, and yet he is color blind and is a dangerous man to have on a railroad. He learns to distinguish colors by intensity of illumination. He sees red, and he knows it is red because it has a certain degree of luminosity; or he learns that a color is red because he has been taught it is red. On the same principle, you may educate a child to call a horse a cat, or a man a woman, if he has been taught that nomenclature. A man may be taught from his infancy that a strawberry is red. You put a strawberry before him, he will tell you it is red, but he does not know the color; he does not know that it is red from the impression that is conveyed to his brain; it is only because he has learned that nomenclature, and the testing by lights is absolutely wrong, and would certainly lead to trouble. The only safe way to test as to color blindness is by the use of worsteds.

Dr. George E. Bellows of Kansas City, Mo.: As to the efficiency of practical tests, we should consider the various changes and varying conditions of atmosphere, light, smoke and fog, under which the trainman is obliged to recognize signals. While a man may be able under proper circumstances to make a discrimination, it follows, from what Dr. Allport has said, in case of smoke, fog, or a dim light, he would be absolutely unable to make the necessary distinction in colors. In testing with the wools or worsteds, we have an efficient means of testing applicants for color blindness.

Dr. R. Harvey Reed of Rock Springs, Wyo.: We have been discussing this subject for the last fifteen years; we have switched off from one side to the other, and we have determined that there are certain railroad men who, when tested with the wools or worsteds, are color blind, yet they have never made mistakes in their runs. The point is whether they shall be subjected to practical tests for the safety of the public, and we all want to be safe. While I am not in the business of examining railroad employes or applicants as to color blindness, yet I do

know, in the tests made on the Union Pacific Railroad, they are tested with a miniature lantern which emits different colors, which is a part of the chief surgeon's duties, after they have passed through the hands of one or two others for final tests. I am satisfied, when men can tell at a certain distance given lights of different colors, he considers them practically able to perform certain duties. I am speaking of the everyday brakeman on a freight train. If he can tell practically the colors you place before him on a train at a certain distance, it seems to me, as a rule, he is a safe man. Men who are not familiar with colors are confused when they are tested with a bunch of yarns. They are not dealing with these yarns. It is confusing to them because they are not trained to the different colors. That is the point I am trying to make. We have under these tests undoubtedly turned down men who were good, reliable men, and perhaps have accepted others for the railway service who were not as good.

Dr. D. S. Fairchild of Des Moines, Iowa: A year ago the American Railway Association asked the Academy to report to them a form of examination which might be made uniform on the different roads, and it happened that I was appointed chairman of that committee, and I have a report ready to make at the proper time when the president may see fit to call for it. There is one question which should interest surgeons in examining applicants for employment on railroads, namely, knowledge of the antecedents of the men who apply for such employment. A man may not be able to pass the examination, yet be intellectually so well equipped as to be a valuable man. On the other hand, we have men who come up for physical examination and pass a perfect examination, whose intellectual qualifications are of an inferior order, and are more dangerous to the railroad company than the intellectual men who cannot come up to the standard required. One question should be considered by the railway management, and that is, whether some men should not be employed for the exclusive purpose of inquiring into the antecedents of the men prior

to the time of their examination. The surgeon, I understand, has to pass upon the physical qualifications of the man who seeks employment. If he finds that he comes up to the standard set forth in the rules adopted by the company, he has done all that is asked of him to do. There is the other question as to the intellectual qualifications of the man or the individual himself who seeks employment.

In regard to the eye, I found from our examinations of the first two years that the percentage of incomplete and complete color blindness was about 4 per cent. In the last two years the percentage has fallen to less than 1 per cent. I was unable to account for the number of men that had passed, and not being in a position to find out the cause, I got my assistants to do it, and we found that a considerable number of these men, at their own expense, sought examinations by someone to find out whether or not they would pass, preferring not to come up for railroad examination if their record would count against them. I imagine that in other cities there is a certain percentage of those seeking employment who go to some oculist to find out what their chances are for passing an examination. If they cannot pass, they do not apply to the railroad surgeon at all for an examination.

PRESIDENT'S ADDRESS.

THE VALUE OF AN INJURY.

BY DR. L. SEXTON OF NEW ORLEANS, LA., DISTRICT SURGEON OF THE ILLINOIS CENTRAL RAILROAD COMPANY.

In view of the fact that we are to be treated, during this convention, to the discussion of various subjects which are purely medical and surgical in their nature, I have determined to vary the program, to some extent at least, and to contribute something on the subject of "The Value of an Injury" for my part on this interesting occasion.

The subject, as presented, is apparently a little paradoxical, and, at first blush, might appear to be more appropriately submitted to a bar association, rather than to an association of railroad surgeons. However, a little more mature consideration will convince one both of the propriety of the subject as stated, and of its discussion by those who are called upon to relieve such injuries before jurors are called upon to assess the value of the same.

We all understand that compensation is both an underlying law of nature and also the law of the country in fixing the amount of damages, and it may be said that in fixing the value, cost or price, as you may choose to term it, of any injury, the law of compensation is the guiding star by which the measure of damages in the instant case is to be determined. The difficulty in the situation, and it is a subject involved in very great difficulty, is to apply the rule of compensation to each individual case as it arises. We are told by the law books that "compensation is the basic principle of the law of damages, the measure thereof being limited and controlled, and the elements of recovery primarily determined by this fundamental consideration." We are also told by the books that "there are frequently elements involved so wholly insusceptible of money valuation that the measure of recovery must

be left largely, if not entirely, to the discretion of the jury. This is noticeably the case in actions for damages for personal injuries where physical suffering has resulted, and likewise where mental distress has been a consequence of the defendant's act."

When we remember how difficult it is to fix any sort of estimate upon physical suffering and how much more difficult it is to measure mental distress by the standard of a dollar, we realize the difficulty of discussing the subject in hand. Not only is the subject surrounded by the difficulties indicated, but that great regulator of prices known as "supply and demand" renders us no assistance in the premises, and up to date at least, the price or value of an injury has not been fixed by any "trust," so far as I am advised, and it is hardly probable that injuries will be considered a luxury in the future, or that the time will soon come when a lost eye, a broken head or a curved spine will be fixed in advance by any of these great price regulators. For all practical purposes I take it that it is safe to say that the value of an injury and the cost of an injury are about the same thing, and, in the nature of things, experience and approved injury cases furnish about the best estimate of value in such cases.

I have already indicated that the "apostolic twelve" generally fix the price in such cases, and unless their verdict is so excessive or grossly inadequate as to indicate passion, prejudice, partiality or corruption, it will generally be allowed to stand, though the courts presiding in such cases have always asserted and exercised the right of setting aside such verdicts, as, in their judgment, are so wholly disproportionate to the injury suffered as to indicate passion, prejudice or corruption on the part of the jury.

While this is true, we are told (to use the language of the law books) that " In no other class of cases does the amount of damages rest necessarily so largely in the discretion of the jury as in those involving a recovery for the infliction of personal injuries, and the courts are very loath to interfere with a verdict in such cases in the ab-

scence of plain evidence that the jury have abused the discretion vested in them."

It must be patent in the outset to every thinkng mind that the value or cost of all injuries must, in the nature of the case, be extremely relative. The loss of one's eyes would not mean the same, in dollars and cents at least, to the day laborer and the accomplished surgeon. The loss of life itself would not mean the same in dollars and cents to the family of a young, vigorous man who gives promise of many years to live, and of a man earning the same salary whose age and infirmity was such as to render it certain that his labors were almost at an end.

At the risk of appearing a little tedious, I shall now call the attention of my auditors to a few cases which have "passed muster" in the courts of the country, in which verdicts for various elements of injury have been rendered, and the judgments entered thereon have been approved by the courts of last resort.

In the case of Morgan vs. Southern Pacific Company, decided by the Supreme Court of California, the plaintiff was a woman and the injury was permanent and total, amounting practically to total disability, and the verdict, which was for $15,000, was sustained. In the case of Chicago vs. Leseth, decided by the Illinois Supreme Court, the plaintiff suffered from a displaced womb, resulting in permanent injury to health. The verdict was for $15,000 and was sustained by the court.

In the case of Bennet vs. New York Central, etc., Railway Company, an $8,000 verdict, in a case of curvature of the spine, was sustained by the Supreme Court of New York; and in the case of International, etc., Railway Company vs. Mulliken, decided by the Supreme Court of Texas, $4,000 was held to be a reasonable verdict for "incurable spinal disease."

In the case of Osborne vs. Detroit, reported in the 32d Federal Reporter, $10,000 was held to be a reasonable verdict for an injury resulting in paralysis of one-half the body; and in the case of Bishop vs. St. Paul City Railway Company, the Supreme Court of Minnesota held that $15,000 was a reasonable verdict for the same in-

jury. The Supreme Court of Wisconsin held, in the case of McMahon vs. Eau Claire Water Works Company, that $5,000 was not an unreasonable verdict in case causing "paresis or progressive paralysis."

A very interesting case will be found in 86 Georgia, which is styled Georgia Pacific Railway Company vs. Dooley, in which a $16,000 verdict was upheld for an injury resulting in the "displacement and enlargement of the heart." The case of Dieffenbach vs. New York Central, etc., Railway Company presents a case of a very severe injury, not necessarily permanent, and the plaintiff, who was a young man earning more than $4,000 a year, recovered a verdict of $25,000, which was allowed to stand.

There is a case recorded in the Federal Reporter (Vol. 78) where a $5,000 verdict was allowed to stand for an injury resulting in the "impairment of muscular sense, feeling and partial loss of hearing." The total loss of vision was the result of an injury, for which suit was brought in the case of Stearns vs. Reidy, reported in 105 Illinois Reports, and a verdict of $9,000 was held to be reasonable. A $14,000 verdict was sustained in the case of Wallace vs. Vacuum Oil Company, decided by the Supreme Court of New York, in which the injury is described as "the loss of eye and other serious injuries." A verdict of $100 was sustained by the Supreme Court of New York for an injury described as "a black eye."

The loss of a leg was held to justify a verdict of $2,300 in the William Branfoot case, reported in Federal Reports (Vol. 52), and the loss of both legs was held to justify a $15,000 verdict by the courts of Arizona, a $13,000 verdict by the courts of Colorado and a $25,000 verdict by the courts of Illinois. The difference in amounts in these cases doubtless depended upon the different state of facts presented in such case. The loss of both legs to a common laborer, earning a dollar a day, would be a very different thing, when measured by dollars and cents, to the loss of a leg by a civil engineer whose salary was $10,000 per annum. The loss of a foot was held to justify a verdict of $9,000 by the Supreme

Court of Georgia in the case of Georgia Railroad, etc., Company vs. Keating; and a verdict of $11,000 by the Supreme Court of New York in the case of Jordan vs. New York Central, etc., Railway Company, and in the case of Commerford vs. Atlantic Avenue Railway Company, the Supreme Court of New York sustained a verdict of $8,500 for the loss of several toes.

In the case of Chipman vs. Union Pacific Railroad Company (12 Utah), the plaintiff was a female child who had lost her foot, and the recovery was $10,500, and the verdict was sustained.

In the case of the loss of an arm, a $5,000 verdict was sustained in one case by the courts of Arkansas, an $8,000 verdict was sustained by the Supreme Court of Illinois, a $4,000 verdict by the Supreme Court of Iowa and a $9,119 verdict was sustained by the Supreme Court of Texas in the case of the Missouri, etc., Railway Company vs. Kirkland, while the Supreme Court of Wisconsin sustained a $10,000 verdict for the same injury in the case of Baltzer vs. Chicago, etc., Railway Company.

The loss of a hand has been variously estimated by approved verdicts ranging from $1,250 to $5,000 in cases reported by the various courts which I have had an opportunity to examine. The loss of fingers has been the prolific mother of many damage suits, and the verdicts have ranged all the way from a few hundred dollars to $8,500, which was the amount of the verdict in the case of Ridenhour vs. Kansas City Cable Railway Company, in which case all the fingers on one hand were disabled.

For injuries resulting in death the verdicts which have been rendered and sustained by the courts of the country, in the nature of things, show the greatest possible variation, and it would serve no useful purpose to undertake to classify them. It would seem but natural that verdicts in such cases should run higher than in cases resulting in the loss of a limb, but it is a curious fact that such is not ordinarily the case, and the well-informed personal injury agent and railroad attorney would ordinarily prefer to defend a case of an injury resulting in death rather than one resulting in permanent disability. The reason is not

very obvious, though it is sometimes accounted for by the fact that a jury has more sympathy for a permanent cripple, who appears before them, than for the heirs or representatives of a dead man, whose injuries are covered by the grave. Like all other rules, this one has its exception, and a pretty widow and orphan children as plaintiffs have frequently caused verdicts to rise very high in the scale when compared with the earnings of the "loved and lost."

It will be remembered that it is the province of the courts not only to set aside verdicts which are considered excessive and oppressive, but it is also their province to set aside such verdicts as, in their judgment, may be inadequate, and it will be of interest to the profession to know that, so far as my investigation has gone, the highest verdict which is reported to have been set aside in the leading legal authorities upon this subject was that in favor of a physician. I refer to the case of Phillips vs. London, etc., Railway Company, reported in 29th Moak, on page 177, where a verdict of £7,000 recovered for "injuries sustained by the plaintiff through the negligence of the defendant" was set aside as inadequate on the ground that "the jury must have omitted to take into consideration some of the elements of damage." "The plaintiff, who was a physician in the prime of life, having a practice worth £6,000 or £7,000 per annum, was reduced by the injury to a condition of powerless helplessness, with every enjoyment of life destroyed, and with the prospect of a speedy death."

While, at first blush, it would seem that a verdict of $35,000 in round numbers appears pretty large, and while any railroad company which was called upon to pay that much for any of us would consider itself pretty unfortunate, still, when it is remembered that this amount only represented about one year's earnings of the plaintiff in the case, that his life was rendered a burden by the accident and greatly shortened thereby, it is perfectly manifest that the verdict should have been set aside as utterly inadequate.

While some of our clients may not be able to appreci-

ate the justice of some of the verdicts hereinbefore mentioned, and while some were doubtless influenced, to some extent at least, by passion and prejudice, yet, after all, it is the duty of every good citizen to bow to the majesty of the law, ever remembering, as was said by another:

"Of the law there can be no less acknowledged than that her seat is in the bosom of God; her voice in the harmony of the world. All things in heaven and earth do her homage, the very least as feeling her care, the greatest is not exempted from her power, both angels and men and the creatures of what condition soever, though each a different sort and manner, yet all are with unform concert, admiring her as the mother of their peace and joy."

The question which presents itself to my mind in this connection is, "What can we do to make our Academy of Railway Surgeons more attractive and beneficial to its members, and, incidentally, to our clientele? Every individual member of the 5,000 or more railway surgeons in the United States ought to be impressed with the fact that some good will come to him personally by fraternizing with us. It occurs to me that if some central meeting point were arranged for, under the academy supervision, at which the district surgeon could meet all the local surgeons once or twice yearly, have on hand an attractive list of clinical material, if not actual patients, make a demonstration of the application and adaptability of all the new splints, dressing and appliances, explain the practical examinations of the eye and ear, the practical methods of dressing wounds and applying all the new bandages and aseptic dressings, the best approved methods and the mode of use of the different anesthetics, both local and general, the uses and applications of the emergency railroad packages, and where short practical papers on practical every-day surgical methods could be read and discussed, such an arrangement would be of incalculable benefit to all of those taking part therein.

In addition to this, the new friends made and the social intercourse that such district meetings would encourage, would develop much of the latent talent that does not

come to the surface in our two days' annual meetings, and we would then give every man a chance to develop what was in him to some extent at least. Again, we should assist each other by recommending patients moving from our locality to that presided over by one of our fellows, thus showing a friendly interest in each other's welfare, and that we are a band of brothers bound together for our mutual good and protection financially as well as scientifically.

As I look over this distinguished body of surgeons and miss the faces of the lamented M. Gardner of California and J. T. Eskridge of Denver, I am again reminded that the physician cannot always heal himself, and of the truthfulness of the thought so forcibly expressed by the words, "What shades we are—what shadows we pursue!" The active and intelligent part which they took in our last meeting was not prophetic of their early end. "Peace to their ashes. Love and honor to their memory. May the earth lie light upon them and the ever-blooming flowers of spring grow green o'er their graves."

A practical suggestion in conclusion, and I will close this address, already much too long. The railroad surgeon cannot prevent injuries, but he can very materially lessen the loss or damage incident thereto by careful, skilful and painstaking attention to each case submitted to his individual care, and, in proportion as we lessen the cost of such injuries, will our services be valuable to the companies whose interests are committed to our care, and it is my pleasure to conclude, from what I have seen of, and heard from my professional brethren assembled here, that the interests committed to them by the railroads of the country, in their responsible position, are in safe, conscientious and competent hands.

CONSERVATISM IN THE TREATMENT OF CRUSHED EXTREMITIES.

BY JERE LAWRENCE CROOK, A. M., M. D., OF JACKSON, TENN. DISTRICT SURGEON I. C., SURGEON N. C. AND ST. L.

The beneficent influence of modern surgical methods is nowhere more strikingly exemplified than in the treatment of crushed and broken extremities of unfortunate victims. Conservatism in the treatment of these injuries is the attitude which differentiates modern from earlier surgical methods. Aseptic and antiseptic technic have reversed conditions, substituted salvation for sacrifice, and limbs of living flesh and bone for those of wood or cork and leather.

In the comparatively recent past for a surgeon to hesitate and withhold the knife in the presence of a crushed and mangled limb was tantamount to an acknowledgment of his inability to meet the emergency and perform the amputation. Not only was this true, but such a policy on the part of the surgeon would have invited septicemia and courted death for his patient. Now, happily for the hapless victim of factory, mine or railway disaster "*Nous avons change tout cela*" and he who saves one limb is accounted more skilled that he who amputates a dozen.

In view of the fact that the vast majority of emergency calls which fall to the lot of the railway surgeon originate from crushing injuries of the extremities, I have deemed this subject a pertinent one to present to this body. I am quite sure that I can best present it by briefly reporting a few cases that have fallen in my hands and leaving further discussion to those whose experience and ability make their words of far greater value to the fellows of this academy than anything I might say.

Case 1.—J. C., age 22, switchman I. C. R. R., while attempting to make a coupling allowed a foot to remain an instant too long on the rail and the wheels of a box car ran over it, producing a compound fracture of the metatarsal bones and crushing all the toes. While amputation seemed to be indicated, a conservative policy

Case of G. C.

was pursued and the injured member was carefully cleansed and dressed antiseptically. Two months' careful attention to the case resulted in saving the injured foot, except the ends of two toes which were amputated by nature. Had an immediate amputation been performed all of the foot would have been sacrificed in order to get healthy, uninjured flaps.

Case 2.—K. D., negro, age 34, section hand I. C. R. R. On July 3, 1903, while standing on a flat car loaded with steel rails the car was suddenly struck by another car, causing the rails to move forward and pinion the victim's legs against the end of the car. A compound, comminuted fracture of the right tibia resulted, and the left gastrocnemius muscle was severed. The patient was carried to the hospital, anesthetized, and the limb thoroughly cleansed. The wound was enlarged, the numerous sharp fragments removed, and the ends of the broken tibia rounded. After this was done there was a space of 2½ inches between the ends of the bone. The gastrocnemius muscle of the left leg, which was severed at the time of the injury to the right leg, was sutured with catgut, and the skin closed over it. Patient now has good use of both legs, and for the past two months has used no brace nor support of any kind.

Case 3.—George C., age 23, fireman M. & O. R. R. On the night of November 19, 1902, while running alongside of track in Jackson (Tenn,) yards, caught his foot in a wire and was thrown to the ground. As he fell his left arm struck against the rail and was run over by the tender of a passing engine. Except a heavy gauntlet glove and his sleeve there was nothing between the wheels of the tender above and the rails below to protect the arm which lay between these two unyielding steel surfaces. That flesh and bone could suffer such a crush without being ground off entirely is a matter of wonder, but that such an arm should be saved as a useful member of its owner's body is almost beyond belief. The skin was lacerated and burst in a few places, but the bones were crushed into numerous fragments and gave the same sensation to the touch as a chunk of ice which had been crushed by pounding in a piece of cloth; no pulse could be felt on either side, and the fingers and hand were cold. The print of the rail and the wheel were plainly visible just above the wrist in a diagonal line across the arm. The suffering of the patient was the most intense I have ever witnessed, morphin, chloral and bromid of potash being required in large doses for several days and nights for ease and sleep.

He was given one grain of morphin in three doses before he was anesthetized and as soon as the chloroform was withdrawn he began to scream again, and required repeated large doses to quiet him at all. Under anesthesia

Case of K. D.

the arm was thoroughly scrubbed with soap and water, followed by sublimate solution until it was as clean as possible. It was then dressed with thick layers of sublimate and sterile cotton, and splints applied after

straightening the arm in a normal position, molding and manipulating the bone fragments by the sense of touch.

The next morning a portion of the hand was warm, but there was no recovery of sensation. It was several days before I could determine whether or not the arm could be saved. Blisters appeared as high as the elbow, but these advance sentinels of mortification were promptly pierced and treated antiseptically, and at all dressings every precaution was taken to prevent septic infection.

At the end of a week nature had won the victory, and recovery gradually occurred. The progress of the case was marred only by a local necrosis of the muscle and tendon on the inner surface of the first metacarpal bone. At that point the remainder of the muscle is bound down to the bone and interferes with full extension of the thumb. This I have offered to relieve by operation, but the patient has not yet consented to it. The photographs show the appearance of the arm to-day, ten months after the accident.

DISCUSSION.

Dr. R. Harvey Reed of Rock Springs, Wyo.: It affords me a great deal of satisfaction to hear members of the academy give their experience, such as the doctor has just given, in regard to the preservation of injured extremities. It shows the progress we are making as surgeons and the benefit we can be to the laity and to the railroad companies we represent, as indicated by our motto.

I have in mind a case which is practically a parallel to the one given by the essayist. In this case a steel coal car loaded with 50 tons of coal passed over the leg of a young man about two inches above the ankle. This young man was the brother of the superintendent of the division in which I was located. There were four persons who saw two wheels of the car run over the limb. At the time I was at Ogden and was telegraphed for by the president of the company to go to Rock Springs for the purpose of amputating the limb of the brother of the

superintendent. I took the first train out and on my arrival went to the hospital, examined the limb, and found the fragments of the foot out of line and the soft parts badly mangled. I, however, found the foot was warm, and made up my mind that it was my duty to save the leg and foot if I could. I have made this a point in this kind of surgery, for I contend that if you take the foot or arm off of a laboring man you make a pauper of him and it is your duty to prevent that if you can. I placed the limb in one of the old-fashioned fracture boxes, with bichlorid dressings, having placed the bones in apposition as near as possible, but, as the essayist has said, I could not put them in perfect apposition because it was impossible to do so. The result was the man got well rapidly and is now working on the Union Pacific Railroad as a brakeman, with about an inch shortening of that limb, which is a good deal better than a wooden leg.

Another case was one of our miners who sustained an injury while prospecting in the hills, two miles from the railroad. He was working with a can of powder, and there was a premature explosion. An ordinary iron wedge, about that long (indicating), and 2 inches square, was shot through the limb and pulled out at the other side, crushing the tibia and fibula and tearing the soft parts. The man was brought to town, with the expectation of having the limb amputated. He was out of humor because I would not take off the limb, but there was good circulation in it and there was a good chance to save it. I took out several pieces of bone and implanted others by means of Senn's method. To-day there is shortening of little less than ¾ inch. I saved the limb and it is a useful one. It is always wise to do conservative work in these cases if it is possible to carry it out.

I also recall the case of a young man who sustained an injury by means of a spinning wheel that exploded, knocking off 7 inches of the ulna, tearing the arm horribly; the radius was fractured. The question of amputation came up. We put him under the ordinary antiseptic treatment; no pus formed, and as the result the man is doing work for the company to-day, with a some-

what crippled arm, but which is a good deal better than no arm.

Dr. Evan O'Neill Kane of Kane, Pa.: I think that to-day, with our modern aseptic surgery we hardly need to say much more in regard to the advantage of trying to save limbs instead of removing them. It is extremely unpopular to say that the thing to do is to slash off an injured leg or arm, and the surgeon who attempts to take a limb off meets with very many difficulties at once. It takes courage for him to remove a limb, and I think he needs a plea made for him. Conservative surgery being all the fashion, and accepted as the proper thing, it is much easier for any surgeon in any case to say, when he sees a badly mangled limb, "I will try to save this," making himself safe in regard to the possibilities in the case. It is an easy thing for him to go ahead and try to save it. He knows very well if it cannot be saved he can be given credit for having tried to save it, and he knows very well that he is not going to be censured if he cannot save it. The majority of patients say at once "I would rather die with it on than have it off," and he knows that he will have the support of all the members of the family, as well as the patient, in trying to save it. Hence, it is unlikely that any surgeon who is called in will take the responsibility of saying, "No, you should not save this. You will lose the man's life by it." Hence, the physician is most likely to say nothing if he feels it is a dangerous question as to whether it ought to be preserved, but he is likely to disagree with you if you should say the limb must come off. Of course, dead men tell no tales, but if a man should die on account of the surgeon having tried to save his limb, he is not likely to be censured for it.

It is a different thing, however, if a surgeon to-day has the backbone, in an effort to do his duty to his patient, regardless of what people may say, to take off a limb when he knows in his heart that to save it would really endanger seriously the man's life. He knows very well that if he takes it off it will always be said by the man himself and his family, it is a question whether the limb could have been saved, that Doctor So-and-So

said it could have been saved if he had been there, and the patient will say that he knows many other people who had their limbs saved, so that they could move their fingers or toes. There are plenty of physicians willing to say a certain limb could have been saved with care. Even if the surgeon decides to take off an injured limb he has to face the possibility that the man may die after the amputation. He has much greater probability of a suit for malpractice by so doing, because the statement is made by others that this man might have had his limb saved, but the surgeon, without waiting long enough, lops it off. The railroad surgeon may sometimes receive the censure of the company he represents for amputating a limb that someone said might have been saved. They may begin to fear that he is one of the slashers, and that he takes off limbs when he might save them. For these and other reasons the doctor who amputates a limb is placed in a very peculiar and painful position, yet he is one who deserves the greatest credit for doing it, because he feels that in so doing he is doing his duty, regardless of the danger and censure.

Dr. A. H. Brumbaugh of Huntington, Pa.: Every good surgeon in practice meets with such cases as have been mentioned, and there ought to be one rule observed, and that is to save a limb when it is possible to do so. Dr. Reed has well said that when you amputate a laboring man's limb you make a pauper, yet every portion of a limb should be saved that is possible in amputating extremities. The parts beyond a joint should always be saved, so as to maintain the continuity of the tendinous attachments. For instance, a finger should not be removed at the joint, but, if possible, immediately beyond it, so as to maintain the attachment.

I had a case similar to the one that has been described, excepting in my case the bone was not crushed, and the small sinuses permitted me to press out all the comminuted parts. The nerve was destroyed, and the arteries, and in my attempt to save the hand dry gangrene set in to the ends of the fingers and continued until it involved the greater part of the hand, and, finally, I

had to remove the hand immediately back of the wrist joint, and save a useful member for subsequent work, that is to say, the man continues to use the arm beyond the elbow-joint and it serves him a useful purpose.

I had another case of a man whose leg was crushed between the end of the car and the step, comminuting both bones and severing one of the arteries. He thought it should be amputated, I thought not. I differ with the last speaker in that he says it takes more courage to amputate a limb than to save it. I think it takes a great deal more courage for a surgeon to attempt to save a crushed limb than it does to amputate it. It is a simple thing to amputate a limb. It is easy, but it is a difficult matter to decide when a limb can be saved. In the case I speak of there was not over ⅝ inch between the step and the end of the car where the bones were crushed. I straightened and strengthened the limb the best I could upon a splint, and subsequently every part of the crushed tibit and every part of the crushed fibula came away as dead bone, and yet the man's leg is the same length exactly. He is able to walk on it. Callus was thrown out around these pieces, and beside them, maintaining the integrity of the leg. Such cases as these we all meet with, and it is better to practice conservative surgery in every instance where it can be done.

Dr. F. A. Butler of Harvard, Neb.: I was very much pleased indeed with the excellent and scientific paper of Dr. Crook; also with the results obtained in the case he reported. This matter of non-amputation is one of considerable importance to practitioners who are located in some of the smaller towns and cities, where they do not all have the advantage to practice surgery as it is practiced in the larger medical centers, where there are hospitals and excellent assistants at hand. In the smaller cities and towns practitioners are expected to save limbs if it is possible to do so. We know that in some cases it is better to amputate limbs than to save them, while in other instances we can with care and good treatment, coupled with perseverance, save limbs that might otherwise be sacrificed.

The President: I would like someone in this discussion to allude to the time consumed in saving these limbs. The remarks of the last speaker would imply that sometimes we can save a limb that is badly crushed, although the indications are for amputation.

Dr. O. B. Quin of McComb, Miss.: In connection with this paper it is necessary to determine whether or not an injury is of such a degree that it requires amputation of the limb. It is perfectly right that we should be very careful and endeavor to save limbs. The extent of the injury should determine whether or not we are taking some chances on losing the man himself by resorting to conservative surgery. I have had some little experience myself as a country practitioner along the line of conservative surgery. I have worked hard to save a limb and to maintain the continuity of some of the extremities and to give a poor fellow a useful member. My experience is that our failures are not often written up in papers that are read before this or similar bodies. I recall cases in which I have consumed several months in an endeavor to preserve an injured limb, and, finally, for the benefit of the injured person, I had to amputate it. I am rather inclined to think, from my past experience, that if my judgment had been better, and I had been sufficiently competent to have known just the extent of the injury at the time (which we must confess is very hard to know always), it would have been better to have performed amputation primarily and given this man less pain, his family less anxiety, and myself a great deal less trouble.

The President: There are two sides to this question of conservative surgery, and I would like to hear from some other member.

Dr. R. Harvey Reed of Rock Springs, Wyo.: It has been my misfortune to handle something like 125 accident cases every month—broken legs, crushed legs, crushed arms, and all kinds and characters of accidents that happen to men who work in the mines, and it has been very difficult for me to decide as to which cases should be treated conservatively and which subjected to

amputation, so as to protect myself as well as the interests of the company. On the other hand, when I undertake to save a limb that seems impossible to save, I take the responsibility of the life of the man, because it is not always possible, even with the best antisepsis and asepsis to prevent septic infection, which means death of the patient. I have two cases in point at the present time.

A Greek was crushed in a tunnel some 75 miles west of Rock Springs, and he was brought to the hospital. On examination I found that the limb was absolutely cold from a certain point down, and it was also paralyzed. In the first place we have to consider that in these cases we must have blood supply, either direct or collateral. Second, we must have nerve supply, and especially from the vaso-motor nerves, to give nutrition to the parts. If the natural blood supply is cut off we may just as well take the limb off and the quicker the better. In this case the Greek refused to have his leg taken off. In about three days from the time he was admitted he was showing septic infection, temperature rising, the man becoming delirious. In ten days from the time he was admitted, under the pressure of his friends, the limb was amputated. It was badly crushed below the knee. I made the amputation above the knee and was unable to get good tissue. I cannot recall a single case of a man who under such circumstances has lived after an operation or without it. This man died three days after the operation. In septic infection we have paralysis of the heart; we have a weakening of the entire system, no matter what is done for the limb. The man is infected from top to bottom, as it were.

I could narrate several other cases in which the parties refused to have amputation performed when it was necessary. Everyone of these cases die in practically the same way. The whole economy becomes disintegrated by septic infection, and my experience is that when we find a man whose nerves and arteries are cut off, the sooner we amputate the better. If there is no possibility of establishing collateral circulation and re-

storing the nerves, wait until you find there are blebs beginning to form below the better tissue and amputate, the sooner the better.

Dr. Crook (closing the discussion): With reference to the remarks of Dr. Kane, that it requires courage to amputate, I think, in the great majority of instances, where we have to perform amputation at once, the limb has already been ground off practically, or injured to such an extent that any ignorant bystander can see that there is nothing to do but to amputate. There is no doubt in these cases as to what course should be pursued. The cases of doubt are the ones always where we should give nature an opportunity to see what she can do. I do not believe, however, in taking much risk, as one of the gentlemen has well said, because, when we have got the nerve supply and arterial supply absolutely shut off, the man is going to die. In such a case I would state to the patient or his friends here is a case in which I do not see the need of waiting. If the friends insist on waiting, let them shoulder the responsibility. If the next day or two, after attempting to use conservatism, you find the hand or foot, as the case may be, has taken on mortification, is foul smelling and cold, and the friends refuse to have amputation performed, the responsibility can be placed on the patient or his friends, or you can get out of the case. If they will not let me amputate when I think it is absolutely necessary to do so I will let somebody else take charge of the case. It is easier for the surgeon to perform a clean amputation than to drag along week after week in attempting to save a limb. The question of time is usually settled inside of ten days. If a piece of bone should necrose remove it. If there is any complication operate on it, as the case may indicate. Frequently in two days, or if you wait in some cases forty-six hours, you can tell whether it is possible to save a limb or not. The question of courage is in favor of the man who uses conservatism. In my opinion, is takes more courage to save than to amputate. While dead arms and dead legs do not tell anything, you may be sued if you have an old, crooked,

ankylosed limb, and there is where the element of courage comes in. I say to the patient or his immediate friends, "If I try to save this limb I can promise you nothing. If it is twisted it is not my fault; I am going to do the best I can for you." But it makes a man feel bad to see a distorted limb, when it was a wonder that it was there at all.

I am glad the gentlemen have reported similar cases. If amputation is indicated it should be made, as with the modern treatment of wounds we take very little chances where we can sterilize a limb perfectly, and the next day we can amputate as well as we could the first day. The main thing I want to say is that whenever we do make an attempt to save a limb we have got everything against us, and there is very little chance in our favor, and this should be made plain to the patient's relatives and friends. The surgeon should say to them, "I am going to do my conscientious duty to the patient; I make no promises whatever; I will do the best I can for the patient." The surgeon should put himself in that light before the patient, and, if necessary, have witnesses to that effect. If you do save the limb you will get credit, and if it has to come off you will feel that you have done your conscientious duty.

OCCURRENCE OF RHEUMATISM WITH MINOR INJURIES OF THE BACK.

BY E. WILSON, M. D., OF ALVA, OKLA., LOCAL SURGEON C., R. I. & P. RAILWAY.

Muscular rheumatism of the back, or lumbago, is an affection due to uric acid deposits in the predisposed muscles or sheaths of the lumbar nerves, and is precipitated by exposure to wet or cold, muscular strain or injury.

When the human organism fails to excrete the products of metabolism a residue in the form of uric acid or its chemical constituents becomes deposited in the various tissues of the body, such as fibrous and serous tissues, and especially that which is habitually engaged in facilitating free and active movements, thus predisposing an attack at any time.

It becomes manifest that when a predisposed individual becomes the recipient of a mild injury to the back, and coincidently has an attack of lumbago, his attending surgeon has a much easier undertaking to give a scientific explanation why his patient is so afflicted than has the claim agent who represents the company held responsible. Much time may elapse and even large sums of money may be paid before those deposits have been sufficiently excreted to permit the affected one to perform his usual occupation.

All, no doubt, have seen cases who have been confined to bed for weeks, caused, apparently, by some slight injury which weakened the re-

sisting powers, permitting uric acid deposits to do their work at the expense of some railroad company. Such idiosyncrasies give an excellent opportunity for those who are willing to be on the sick list, especially when a generous income is to be had without work; yet many are aware of that latent disease which is only waiting for an opportunity to render its victim unable to perform his duty. To these, no doubt, the claim agent would extend his generous heart, if such patients could be classified; and, furthermore, the attending physician is often—by choice of the injured, not connected with the company—held accountable for the past indiscretions of the injured.

The diagnosis between a severe and a slight injury of the back, accompanied with rheumatism, may be attended with difficulty, even when there is no tendency on the part of the injured to have a grave disagnosis made. Temperature, the results of palpation and exclusion, would be the means of differentiation. Prognosis, unless there is a psychic change in the mind of the injured to imagine that he will soon be rewarded with a liberal settlement, a cure will be effected, as a rule, in one or two weeks, but one attack always predisposes others. Prophylaxis is of much importance. Proper clothing, bathing and a suitable diet will add much in preventing attacks.

A coated tongue, distended abdomen and deposits of biliary matter, constipation form the basis of lumbago. The first step in the treatment consists in opening the means for exit of the waste matter by cholagog cathartics, diuretics, hot fomentations, hot baths and fresh air. A combination of lithium, salicylates, potassium iodid and potassium acetate

should be given, not only during but following the attack. Rules of diet to conform with the physiological requirements may be given, but as a rule he who proposes such scientific tables is the first to violate the same.

I do not pretend to have gone to the end of thought in lumbago, but hope I have so presented the subject that a discussion will result by which each may benefit.

DISCUSSION.

Dr. E. F. Woods, of Janesville, Wis.: I think probably these minor spinal injuries connected with rheumatism are among the most difficult things we have to contend with in making diagnoses, and my experience has been that a great many of them are cured as soon as they get good sums of money from the company. Their backs get well. Some of them undoubtedly have rheumatic trouble when injured. I recall quite a number of cases that have come under my observation. They would linger along for a long time; we could not find any injury; could not find any uric acid; still they complained of pain in the back. But as soon as the claim agent presented them with greenbacks they got well.

Dr. H. C. Fairbrother, of East St. Louis, Ill.: This is an interesting subject for this body to discuss. The paper was very short, but nevertheless good. There may be complications connected with spinal injuries. We may have rheumatism with or without injury to the back; not only the back, but other parts of the body. We all have to meet with that frequently, and one addition to the means of finding whether it is rheumatism or an injury to the spine is the previous history. Most doctors can look into the face of a man and get

at the truth as to whether or not the patient did not have rheumatism before without injury to the spine, either alleged or real. That has happened to me very often in complaints about the back, the knees and ankles, and I have found out that the man had rheumatism. He has admitted it to me when I have been treating him for an injury of the knee or supposed injury. I found fever and swelling; I found rheumatism, and he has admitted that he had rheumatism before. Too many of these cases are palmed off on the railroad companies and accident companies as injuries, and I am glad the subject has been brought up, in order that we may be more on the alert and be better posted in differential diagnosis, and give to rheumatism what is due to it, and an injury what is also due to it.

Dr. L. Sexton: Has anyone a test to suggest so as to tell when a man is malingering or when he has rheumatism?

Dr. W. U. Cole, of Columbus, Ohio: I have no test to suggest, but this class of cases has been decidedly interesting to me, and I think the malingerer cuts very little figure. In the first place, the companies for which I look after injuries do not plaster them heavily with greenbacks; they do not malinger for the purpose of gaining. But conditions present themselves sometimes like these: A man goes home or is helped to go home or to a hospital. He says: "My back has given out. I can't turn." He has pain in the back. He may not be a malingerer. The question is, What is the condition? Some say it is due to a rupture of the fibers of the muscles. Whether that is true or not has not been proven. Once in awhile a man may play the part of a malingerer. Some of these men, when brought face to face with

the facts, prevaricate. If a man tells you the truth he usually sticks to the text. It is necessary to differentiate between right and wrong. In considering and determining the nature of these cases we have no better test than to rely on their history.

Dr. A. L. Wright, of Carroll, Iowa: This whole question hinges on diagnosis. A man who is known to be thoroughly reliable as a conductor, a brakeman or engineer, if he jumps from his train and thinks he has twisted his back in some manner will be unable to move very much. You may not get any history of previous rheumatism. The question is, Is the jump or sprain the determining cause, or has there actually been a rupture of the muscular fibers? If there is a rupture of the fascia or of a few fibers, as has been contended, there would be more or less ecchymosis; more or less swelling, which you will not get in a uric acid diathesis or rheumatic condition. As to the question of whether any trauma has been or can be inflicted to the soft tissues, without there being some ocular evidence of these possibly few muscular fibers very deeply located in the back, even then there would be some swelling, something besides the subjective symptoms. It is difficult, at least it has been with me, to differentiate in some of these cases.

Dr. Wilson (closing): I do not think it is necessary for me to add anything further. So far as the history is concerned, sometimes the personal history is almost *nil*. Notwithstanding all the coaxing and entreating you may do with these patients, you can not tell whether they are telling the truth or not sometimes. Some of them are good at sticking to their text, whether they are telling the truth or not.

SURGERY OF THE SKULL AND BRAIN.

BY C. H. MAYO, M. D., OF ROCHESTER, MINN.
Surgeon to St. Mary's Hospital.

There are today but few fixed facts in the surgery of any region, and at all times innumerable instances can be related to disprove dogmatic assertions. Again, there are methods generally practiced which have been evolved by those whom we, as general surgeons, consider specialists in certain lines of work. Such methods are attended by an average percentage of success and mortality, are best followed, and as nearly as may be possible will be advocated herein.

There are certain conditions which occur in injury from infections and from fractures which are consequent upon anatomic facts, and a brief review of this region will be of advantage.

The superficial fascia of the head is closely adherent to the skin and contains the nerves and vessels of the scalp. The latter consists of frontal, temporal and occipital main branches upon each side. The deep fascia consists of the aponeurosis of the occipito-frontalis muscle, which is free from bony attachment anteriorly, laterally is attached to the ridge of the temporal bone and mastoid process, and posteriorly is attached to the superior curved line of the occipital bone. The blood supply being so extensive we seldom see necrosis of flaps, even when the pedicle is small or they have been severely bruised. Incisions which include both skin and

aponeurosis gape open, this being more marked when they cross the fibres of the aponeurosis. Hemorrhage is controlled by forceps and ligature. If this is difficult a lock stitch is inserted to enclose the vessel. In extreme cases a tightly drawn rubber tube is placed around the head, including forehead and occiput, passing above the ears with small pads beneath it at the region of the frontal, temporal and occipital arteries. This gives a bloodless field and is often employed for operations upon the skull and brain. Bleeding from minor wounds may be controlled by direct pressure.

The scalp is so frequently the harbinger of pus producing germs, not unusually of the streptococcus type, that injuries to it often greatly concern the patient's life, or again the injury itself may be of a septic nature. Pus forming beneath the aponeurosis is soon under tension, and spreads beneath the tough and firmly attached fascia. The numerous communicating veins which connect this region directly with the veins of the diplöe as well as the meningeal veins and sinuses, render suppuration extremely liable, by phlebitis and periphlebitis, to extend to the intra-cranial region.

The careful examination and surgical cleansing of a scalp wound is of the utmost importance and it is a good rule in such work to cut away the hair, scrub, use antiseptic solutions and make the edges of lacerated wounds into clean cuts to the point of its appearing to be overdone. Time will efface the damage which the surgeon produces, while his neglect may destroy the patient's life, as many scalp wounds involve the skull and brain. Suppuration beneath the scalp requires early and free drainage for the same reasons.

Scalp wounds of the frontal region have at

times caused reflex blindness; such cases are reported by Dupuytren and Fischer. A similar case recently came under my own observation following a railroad injury. The condition lasted for three weeks with total recovery of vision in about six weeks. Scalp injuries which have left irritable scars sometimes require excision, and a few cases of epilepsy, where the aura preceding the convulsion is a pain in the scar, have been reported as benefited by such surgery. Some individuals have well marked suture lines which have been mistaken for fractures and in some instances the appearance of the Wormian bones in sutures has led to the same conclusions. The periosteum is limited by the suture lines, thus preventing the spread of sub-periosteal effusions. This membrane is fairly thick, yet has but scant bone forming power. Von Bergmann states that openings of 6 or 8 centimetres square may not be expected to close with bone. The diplöe contains innumerable vessels, and unites the two tables of the skull, either of which may be fractured independently of the other. The two tables separate in the anterior portion of the skull, forming the frontal sinuses which develop after puberty. The veins of the various sphenoid, frontal and mastoid cavities communicate with the adjacent dural sinuses, thus rendering intra-cranial suppuration possible by their infection. The inner table is the more brittle, and fragments of this bone following severe injuries may lacerate the meninges and brain without external evidence of severe injury.

"Contre-coup" fractures are now considered to be from compression and bursting effects. Fractures of the skull are known as fissured, comminuted or depressed, and may be simple or

compound. With a scalp wound present, there is no probe like the aseptic finger to aid in making a diagnosis of the skull condition. The method of Andrews in the use of a tuning fork upon the supposed fracture area, the sound transmission being tested about the head with a stethoscope, will at times be of advantage. Uncertainty with any brain symptoms calls for free incision. The skull is opened by means of trephine, chisel and rongeur, and saws, straight, revolving or wire, or Devilbiss bone cutters.

In case of fracture requiring operation, we prefer to make the primary opening by means of a chisel, enlarging this with the rongeur forceps. The operations for tumor or secondary symptoms following injury, require larger openings for inspection than those produced by the old type of trephine. The present opinions are in favor of large openings by means of an osteoplastic flap. The most profuse hemorrhage may be encountered from the diplöe, which probably is more profuse by the methods which make clean cuts, than by one which crushes the two tables in its action like the Devilbiss cutter. When encountered, it can be checked by crushing the bone or plugging the canal with Horsley's wax or catgut, and a wood toothpick may be temporarily employed for this purpose. Shall the bone flap, chips or button be replaced? In primary aseptic operations, yes, when made for injury. In compound comminuted fractures the bone may be replaced entire or a portion left out for tamponage. If such fractures are thought to be complicated by probable septic contamination, the unattached fragments of bone are best removed. In secondary operation the bone is usually replaced. In operations made for the relief of incurable tension or for the drainage of chronic cysts or

abscesses, more or less of the bone flap may be removed with advantage. Drainage is best employed for hemorrhage or abscess, gauze being preferable, with capillary drains for cysts.

The cystoid scar of Von Bergmann is a condition of cyst in the brain reaching to the scar, which at some point is directly connected with the scalp. This matting or blending of all structures in the scar is of frequent occurrence, and in certain injuries almost impossible to prevent, yet the cystoid scar is a condition which followed the older type of surgery in this region more often than the modern. Such conditions are fairly frequent following compound fracture and bullet wounds.

The brain is peculiar in structure when we consider its possibility for repair of injury. Its surface is connected with the lymphatic system by the arachnoid. The structure of the brain proper is filled with lymph areas; but not in the sense of having a free lymphatic circulation. There is practically no reparative power. Concussion produces unconsciousness according to the stability of the cell and from the non-yielding character of its enclosure. Meningeal sepsis gives increased temperature while abscesses in its substance may cause sub-normal or no change in temperature as the lymph spaces are not absorbents, having but a limited lympathic circulation. Chills followed by temperature and sweating indicate that septic areas communicate with a sinus. The sudden unconsciousness following a blow upon the head is not an unusual occurrence but recovery from this condition to be followed after a more or less brief interval by a return of unconsciousness means hemorrhage, with or without fracture, and should lead to exploration with the same indications for urgency

that we would explore the abdomen after stab or gun-shot wounds. Many of the head injuries received in football are of this type. An acute edema may occur immediately upon the unconsciousness of concussion and result in death from pressure, without a return to the conscious state. In these cases there will be found great brain tension upon exposure, and where the pressure is not from a hemorrhage, the ventricle may be aspirated with great benefit in relieving the immediate pressure symptoms, as has been pointed out by Frank of Chicago.

Hemorrhages upon the surface when small in amount may be slowly absorbed by the meningeal lymphatics. Accummulations of blood in the interior of the brain have little chance for absorption. They more usually develop cysts by degeneration of the blood cells and a deposit of fibrin, a certain degree of walling off being thus attained, and the resulting symptoms will be from the changes in the function of the area involved. To no one, then, is the cerebral anatomy of more importance than to the surgeon, and it is still surprising what large areas of the brain may be compressed or destroyed without recognizable symptoms. The increase of pressure from depressed fracture or hemorrhage may possibly amount to 1-12 of the cranial contents but by slower developed conditions, such as tumor, 1-6 of the space may be occupied and the patient live. The operations for meningeal hemorrhage are developing increasing confidence in cerebral surgery.

Capillary drainage of cysts is best and as a cyst indicates that the disease is of a chronic character the brain is accustomed to the pressure condition, the walls are firm, and the cavity will probably not collapse or be entirely obliter-

ated; therefore, the skull should be removed or provision made for its depression over a sufficient area to allow a region of obliteration equal to the space involved in the cyst, just as we would do a rib resection for chronic empyema.

There are certain large cysts and, as well, some cases of focal epilepsy, in which the benefits of accessory lymph drainage will prove of practical benefit. In this operation we turn a large osteo-plastic flap and a similar one in the dura; the base of the broken skull flap is removed by the rongeur forceps to leave a narrow space through which the knife is thrust, cutting the aponeurosis across 2-3 of its width in its center. The dural flap is thurst through this incision and the bone flap replaced over the arachnoid. This dural flap serves as a drain to the subcutaneous tissues and tends to relieve the edemmatous tissues which is a pathologic condition in life, but so frequently shows but little post-mortem change.

Fractures of the base of the skull are a frequent cause of immediate death. The later deaths from such fractures as a rule can be traced to infection of the interior of the skull, through the sphenoidal sinus or middle ear. What may be expected from injury involving the scalp, skull and brain? That there will be at least a temporary fusion of all tissues in the scar, that in such compound fractures occurring in the developmental period of life, say under 20, we will be extremely liable to have epilepsy follow.

The most common secondary symptom following brain injury is epilepsy. There is an exacerbation in surgical fervor from time to time, with reference to the possibilities of relief in these sad conditions, and as often a relapse. In reviewing the surgical methods which

seem to have been followed by the greatest degree of success, we find that large exposures of brain, the implantation of metal foils, membranes and plates, have each had a fair amount of success. More recently the removal of a large area of the dura seems to accomplish much relief. The most successful operations have probably to credit the lymphatic drainage for their permanency.

I have been so much pleased by the syllabus of treatment of injuries of the skull and brain written by J. B. Roberts in 1885, that I take the liberty of adding it to this paper as being worthy of reference. The adverse discussion at the time presented and the general acceptance of its teachings today show the relative progress or surgery in such conditions and how a surgeon may be in advance of his time.

SYLLABUS OF THE TREATMENT OF FRACTURES OF THE CRANIUM.

CLOSED FISSURED FRACTURES.

1. No evident depression, no brain symptoms. No operation.

2. No evident depression, with brain symptoms. Incise scalp and trephine.

3. With evident depression, no brain symptoms. Incise scalp and possibly trephine. (See note below.)

4. With evident depression, with brain symptoms. Incise scalp and trephine.

CLOSED COMMINUTED FRACTURES.

5. No evident depression, no brain symptoms. Incise scalp and trephine, possibly. (See note below.)

6. No evident depression, with brain symptoms. Incise scalp and trephine.

7. With evident depression, no brain symptoms. Incise scalp and trephine.

8. With evident depression, with brain symptoms. Incise scalp and trephine.

OPEN FISSURED FRACTURES.

9. No evident depression, no brain symptoms. No operation, but treat wound.

10. No evident depression, brain symptoms. Trephine.

11. With evident depression, no brain symptoms. Possibly trephine. (Note.)

12. With evident depression, with brain symptoms. Trephine.

OPEN COMMINUTED FRACTURES.

13. No evident depression, no brain symptoms. Probably trephine. (Note.)

14. No evident depression, with brain symptoms. Trephine.

15. With evident depression, no brain symptoms. Trephine.

16. With evident depression, with brain symptoms. Trephine.

PUNCTURED AND GUNSHOT FRACTURES.

17. In all cases under all circumstances. Trephine.

[Note.—In classes 3 and 11 I should be inclined to trephine if the depression was marked, or the fissure sufficiently multiple to approach the character of a comminuted fracture. In classes 5 and 13 I should trephine, unless the comminution was found to be inconsiderable.]

From our own experience we would say that since operations for sequelæ of injury to the brain are but seldom followed by permanent relief and partial relief is so indefinitely connected with any actual surgical work performed, that which is to be accomplished should be by primary effort at the time of injury, or immediately upon the development of secondary symptoms before the brain cell loses its stability.

FRACTURES OF THE SKULL.

BY A. L. WRIGHT, M. D., OF CARROLL, IOWA.

It is not the province of this paper to take into consideration and discuss the many forms of fracture occurring to the skull. The subject is too vast and the time allotted insufficient to even permit mentioning much that is important in this connection. The paper will present a few thoughts regarding fractures at the base only, that have suggested themselves while in attendance upon cases of this kind. I am convinced that much which has gone forth is erroneous and that the views handed down regarding the enormous fatality is traditional and not founded on careful clinical observation.

The mortality as given in our text books is 80 per cent of all sustaining a fracture at the base. This, in my judgment, is excessive. Even by doing nothing, letting the patient alone, a larger per cent than given will recover. Considerable space will be given to the clinical manifestations presented in this class of injuries, with a view to aiding in a more accurate diagnosis and determining, if possible, the class of cases suitable for operative intervention. A clear and comprehensive understanding of those cases of severe cranial injuries that fall into our hands will greatly aid us in determining what course to pursue. The large mortality as it now stands is a rebuke to the progressive surgeon. A certain number die by reason of the severity of the injury; this we

can not avert. There is, however, another large number that die from surgical neglect. It is to reduce the mortality in this class that the views herein expressed wish to accomplish. Why not investigate at once indubitable and serious injuries at the base as well as in other parts of the body?

It seems to me that we should anticipate well-known disastrous sequelæ before they are manifest and head off pyogenic germs before they do business, protecting the encephalon and its membranes by inaugurating prompt surgical measures in proper cases; then the mortuary tables will be still further improved. My deductions in this connection are based upon a reasonably large experience in this class of fractures and a careful consideration of the cases that have been under my observation during the past 30 years. A careful clinical record was not kept during the first half of this period. Our recollection, however, of the clinical course and treatment pursued, as well as the conclusions drawn at the time, are quite fresh and are sufficiently reliable for the purposes of this paper. The contrary is true during the last half of this period. A careful record has been kept at the hospital in each and every case under observation, and we are forced to the conclusion that not to exceed 25 per cent of all basal fractures die as a result of the injury.

A fracture at the base of the skull, inflicting more or less damage to the soft parts within, with its manifol symptomatology and enormous mortality, makes this class of fractures more interesting and of greater importance than any other. No two cases pursue the same course, either in chronologic order of the manifestation of symptoms, or the pathology and

extent of damage done. This is due to the involvement of different anatomic structures and the amount of trauma inflicted to the soft parts within the skull. A most extensive fracture at the base may exist with comparatively few symptoms. Then again a very trivial fracture may result in extensive damage to the soft structures and the most grave clinical phenomena follow. The location of the fracture hidden from view and difficult of access, makes accurate diagnosis very difficult. Phelps maintains that 60 per cent of all head injuries result in fracture at the base. All severe injuries of the head are attended by a large mortality. The death rate as given is a frightful commentary on modern surgery, boasting of its wonderful achievements during the past few years. It is a lamentable fact that so large a percentage succumb to this class of injuries. This is due partly to the severity of the trauma inflicted, and still more to the lack of efficient treatment sufficiently early to be of benefit in relieving the immediate danger of the trauma and averting the disastrous sequelæ that follow in a large proportion of cases.

Many theories have been advanced to account for a fracture at the base when the force was applied to the vertex. Aran maintains that a fissure starts at a point where the injury is inflicted and takes the shortest possible route to the base. The sutures exert little or no influence on the course the fracture takes. The direction depends entirely upon the angle at which the force is applied. It was thought at one time the theory of "Countrecoup" would satisfactorily explain the mechanics of basal fractures. This, however, does not meet the requirements at the present time and is not generally accepted. It assumes that

each and every blow is a diffused one, an assumption that is not substantiated by facts. That the spheres were uniform in thickness, strength and elasticity. This certainly does not apply to the skull. Saucerotte maintained that the vibrations of the skull wall set up by the blow would travel in all directions through the walls of the skull, accumulate and concentrate themselves at a point opposite that on the head where the blow was applied, producing a stellate fracture at the focal point. This does not seem rational, as it does not take into consideration the varying thickness of the skull in its different parts. Nor is sufficient importance attached to the modifying influence the several openings exert in directing the vibratory waves in their rush to the underlying focal point.

I am of the opinion that fractures at the base are a result of direct violence, as in a headlong fall the head is brought to a standstill, the momentum of the body carries the spine on into the base, producing a stellate fracture and inflicting so much damage to the contained soft parts as to cause immediate death in many cases. Sufficient force may be applied to the facial bones to cause a fracture at the base; for example, where a severe blow is delivered under the chin with sufficient force to drive the condyles of the inferior maxilla through the glenoid fossa into the cranial cavity, as in case of Robert H., a machinist, while engaged in jacking up an engine was struck a most violent blow on the apex of the chin by the lever of the jack, the mechanism of which failed to hold. He was picked up in an unconscious condition. When seen thirty minutes later was just regaining consciousness and complained of the most intense pain in

back of his head and temporo-maxillary articulation. This pain continued for about two weeks, was so intense the man was unable to return to work during this time. While unable to prove beyond the question of doubt that this man had a fissured fracture in the temporo-mandibular articulation, I am of the opinion, based upon the intensity of his symptoms at the time, there was a fracture at this point. The absence of severe damage to the soft parts in close juxtaposition accounts for the absence of symptoms other than those mentioned, and the speedy recovery corroborates the theory that there was no damage to the encephalon and its investing membranes. A thrust with sword, stick or bullet may penetrate the cranial cavity through the mouth, nose, ear, or orbit, producing a compound fracture of great gravity.

There are many modifying influences which determine the direction a fracture takes. The direction of the trauma and anatomic conditions are the most important factors. The varying thickness of the bones at the base and the many apertures must exert a determining influence on the direction the lines of cleavage take. There are many cases without symptoms that escape notice, or at least are passed without an accurate diagnosis having been made. This can readily be understood when we consider the location of the fracture and the impossibility of getting at it for examination; the parts are hidden from view and out of reach. In a certain number it makes little difference so far as the treatment and result is concerned.

A fracture at the base consisting simply of a fissure without laceration of the soft tissues, either within or without, unattended by hemor-

rhage, is not likely to present very marked symptoms, or the clinical evidence may be so evanescent as not to attract attention. These patients are generally picked up unconscious, or so bewildered as to be unable to give an accurate account of the accident. This mental uncertainty will last for days or weeks. As they begin to show signs of returning consciousness they frequently become delirious, often of a mild type, but generally of a boisterous and violent character, requiring the constant care of an attendant. Three cases have been under my observation recently where the delirium was of the ambulatory type, the patients making almost constant efforts to escape from the nurse. The control of the bladder and bowels is frequently lost, involuntary discharge takes place from both. Retention does not occur very often, but when necessary the catheter must be used. The patient manifests no interest in what is occurring about him. There is no evidence of cerebration, the organs of organic life are performing their function—nothing more. He is a living automaton.

Blood may be seen issuing from the mouth, nose or ear. When considered singly, it conveys but little information, but taken in conjunction with the other evidence will complete the picture. The source of the hemorrhage should be carefully sought after so as to enable us to accurately locate the injury, its extent and importance. When found issuing from the nose there may be a fracture of the cribriform plate. If the hemorrhage is from the mouth, its source must be carefully sought for, as it may issue direct from a fissure in the mucous membranes of the pharynx or run into the mouth from the posterior nares, or owing to the membrana tympani remaining intact

may escape from the middle ear via the eustachian tube. Blood escapes from the external auditory canal in over one-half the cases of fracture involving the petrous portion of the temporal bone, the flow is free and often lasts several days. It may be excessive and even dangerous. In one case under my care last winter the loss of blood was so great as to be a cause for alarm.

The escape of cerebro-spinal fluid has been looked upon as a very grave symptom, a forerunner of an inevitably fatal issue. This, however, is not correct, as we have all seen cases where this fluid escaped and the patient recovered. Park reports three cases where the fluid became purulent that made complete recoveries. On the other hand, Crile has reported a fatal case of fracture involving the petrous portion of the temporal bone with laceration of the meninges without the escape of cerebro-spinal fluid. It never escapes unless the meninges brain are torn. Devonbaix claims the sheath of the auditory and facial nerves must be lacerated and torn in their foramina of exit before the cerebral fluid can escape into the external auditory meatus. At all events, when found escaping from the ear it indicates that the petrous portion is involved in the fracture and the membranes torn. The amount that escapes is small and does not continue any great length of time. Tillmanns has reported a case which recovered though 600 to 800 grammes escaped. It should be borne in mind that this fluid mixed with blood makes a most excellent culture medium, and the danger of infection is necessarily great.

The escape of cerebral substance is indica tive of an extensive lesion and sufficier grounds for apprehension. A large amount

presumptive evidence that great damage has been inflicted to the brain, and the result will in all probability prove fatal. Or the amount that escapes may be so small as to require the aid of the microscope to determine the exact nature of the escaping fragments. While the escape of cerebral substance portends the gravity of the injury, it does not necessarily follow that it is incompatible with complete restoration to health. A satisfactory explanation has never been offered why some extensive injuries to the head and brain, with loss of a large quantity of blood, cerebro-spinal fluid and brain substance itself recover and others seemingly slightly injured die.

Attempts have been made to determine accurately the exact location and extent of damage inflicted in a given fracture. The greatest difficulty experienced is due to the fact that the fractures at the base are not apt to be limited to any one of the cranial fossæ. The most distinctive manifestation of fracture in the anterior fossa is ecchymosis under conjunctiva, hemorrhage into the orbit, or from the nose. Efforts have been made to locate the injury by the pupils. This information is very unsatisfactory. The prominence of the eyeball is due to hemorrhage in the orbit pushing the globe out of its place. This occurs when orbital plate of the frontal is involved. The disturbance of vision in these cases is generally pronounced.

Blood escaping from the external auditory canal indicates fracture of the middle fossa. On examination the line of fracture can be seen in many cases, as well as the rent in the membrana tympani. The blood gushes from the same and interferes with the examination, and must be carefully wiped away. When the

fracture involves that portion of the ear where the mechanical apparatus of the sense of hearing is located, this special sense is almost invariably lost. Allen has reported one case where total deafness in both ears followed fracture at the base; he also reports one case of complete loss of smell and impairment in another. The presence of tinnitus, or of unpleasant sounds, is suggestive of severe injury to the ear. One case of impaired hearing following fracture at the base has fallen under my observation. A small area of discoloration just above the ear, deepening in intensity as the ear is reached, also indicates the fracture is in the middle fossa.

A fracture involving the posterior fossa is accompanied by the most intense pain in the occipital region. A careful examination of the pharynx will sometimes reveal a rent in the mucous membrane, with blood and cerebral substance escaping from it. Ecchymosis in front of the mastoid and extending upward and backward is suggestive that the posterior fossa is involved.

Paralysis of a nerve following a basal structure indicates that the line of cleavage is through the foramen of exit, and that the nerve is lacerated or pressed upon by a spicula of bone or blood clot. The paralysis may be due to damage to the brain itself, in which event the injury is on the opposite side to the paralysis. If the nerve is injured in its passage through the skull the paralysis is on the same side. Two cases of basal fracture involving the aqueduct of Fallopius have fallen under my observation. The paralysis of the facial nerve was complete in both cases and had not cleared, up to the time of the men leaving the hospital and passing from observation. A

general paralysis indicates that the brain itself has been seriously injured. Motor and sensory disturbances suggest that the injury is at the base. It is impossible to maintain the equilibrium—the gait is unsteady and staggering, with a tendency to reel toward the injured side. Clots of blood and fragments of bone pressing on nerves in the vicinity of the fracture produce the characteristic paralysis of the involved nerves, or may result in a distressing and exceedingly obstinate neuritis.

The primary object in contributing this paper is to call the attention of the fellows to the imperfect treatment outlined today and urge more energetic efforts in a certain class of injuries at the base of the skull, now left to die from surgical neglect, or from following a positively harmful plan of treatment. I do not wish to be understood as advocating surgical intervention in cases so seriously injured, death is inevitable from the very nature of the injury, or that any kind of surgical procedure will hasten. This is not the object aimed at, neither do I wish to be understood as advocating opening the skull when there is simply a fissure involving the base, where the trauma inflicted is so slight as not to give rise to symptoms of any kind. The line of fracture has not torn the meninges and opened up the cranial cavity to the outer world, through the several mucous membranes in close proximity. These are cases without symptoms. They are like the case already cited, where a cranial fracture is suspected but can not be proven. They require little or on treatment. Morphine, to control the intense pain in the head, and the ice cap with rest in bed is all that is indicated. Leave these patients alone and they will recover. There is,

however, a very large number of cases presenting a history much like the following case, recently operated on, that if left alone will die, whereas if operated upon an otherwise fatal issue will be prevented.

Dom. S., aged 45, an Italian laborer, was knocked from a handcar while engaged in racing with another crew. When picked up he was unconscious, blood was flowing freely from the mouth, nose and ear. Dr. Bisgard, of Harlan, was promptly at hand and, recognizing the great gravity of the case, brought him to the hospital at Carroll at once. A careful examination revealed but little, still we were enabled to determine that the ear drum had been torn, and there was a continual hemorrhage from the auditory canal. The man was profoundly comatosed—we were unable to elicit an intelligent word from him. The contents of the bladder and bowels were evacuated involuntarily. Believing I had a fracture at the base through the petrous portion of the temporal bone, an osteoplastic flap was turned down after shaving the entire head. We were then enabled to detect a fracture involving the roof of the external auditory canal extending into the middle ear, displacing several fragments of bone into the cranial cavity, one of the sharp fragments having completely severed the middle meningeal artery. The loose pieces of bone were removed, the displaced pieces with periosteal attachment were elevated to their place, a small cigarette drain was introduced well into the middle fossa along the petrous portion of the temporal, and the head encased in a plaster cast. The drain was left in place for several days. The man began to improve at once and made an uninterrupted recovery, except a paralysis of the facial nerve that had

existed from the first and showed plainly that the fracture extended into the aqueduct of Fallopius.

The history presented by this case represents that of a fairly large number of cases which fall into the hands of all surgeons. Had this man been left alone, or treated by washing the external auditory canal with some antiseptic solution, he would have promptly died, either from hemorrhage from the cut artery, or from infection extending along the line of fracture into the cranial cavity. It is this class of cases that early surgical intervention will as surely save as early suturing wounded intestines following severe abdominal injuries.

The first great danger in all severe injuries at the base of the skull is from shock. This must be met and vigorously combated. Care must be exercised not to mistake other pathologic conditions for shock. The more I see of this *ignis fatuus* the firmer are my convictions that it is a cloak behind which we hide our ignorance, and a symptom only of hemorrhage or some other great damage that we can not put our finger on at the time. The second element of danger is from internal hemorrhage. The blood vessels are lacerated and torn, giving rise to intracranial hemorrhage and later pressure symptoms, which will result fatally unless the bleeding vessel is secured. The tearing of the meninges and brain itself establishes an unbroken line for pyogenic germs to reach the cranial cavity from the unclean mucous membranes of the nose, pharynx and ear through the line of cleavage in the bone. This is the source of danger. We must not overlook the facility with which the veins of the diplöe, bathed in blood, and the escaping cerebro-spinal fluid become infected and dis-

seminate this infectious material to the meninges or the encephalon. While not always fatal, a large number die from phlebitis, meningitis, or osteo-phlebitis that can be prevented by early recognizing the source of danger and establishing drainage in advance of an invasion of pyogenic organisms.

All recognize the impossibility of getting the mucous membranes of the nose, mouth and ear surgically clean. The danger of trying to wash out any of these cavities by forcing water into them with a syringe can not be overestimated. It is a dangerous practice. If the fluid is thrown with sufficient force to wash away detritous, it is very apt to carry the poison into the wound and increase the danger of infection rather than lessen it. Such measures are a travesty on surgery and should be abandoned. It is a burlesque and annoying to the patient, who will resist and crawl to the far side of the bed in his effort to escape punishment. Wiping with a pledget of cotton will do more good and infinitely less harm if care is taken not to inflict more damage to the soft parts.

In this class of fractures we should anticipate serious and well-known complications before sufficient time has elapsed for their development. Then it will be too late. Operative intervention must be instituted early and at such point as will enable us to reach the damaged area by the shortest possible route. The entire scalp should be saved for the twofold purpose of first lessening the danger of infection and, second, to enable a more accurate examination of the skull. Unless this precaution is taken clots of blood under the scalp and slight evidence of the location of injury will escape notice—depressed fractures are readily overlooked when the hair is in place. The

turning down of an osteopathic flap large enough to admit of a thorough examination of the skull floor and its contents is a safe procedure, and should be done with the same fidelity to duty as is exercised when encountering a severe trauma in other parts of the body. The encephalon can be lifted up, the bleeding points secured, blood clots and spicula of bone either removed or lifted to place, as the case may be, with the same degree of safety as in injuries of like gravity elsewhere. If the fracture involves the orbit it should be freely opened and thoroughly explored, securing the bleeding vessels, elevating the depressed bone and removing loose pieces. Trephining the frontal bone may be necessary to thoroughly explore and drain the frontal fossa. The same applies with equal force if the fracture is in the posterior fossa. If the fracture has opened up the mucous surfaces of the nose, fauces or ear, a small wick drain should be inserted, carefully covering the line of fracture and protecting the brain and its membranes from the extension of infection through these channels.

While this course seems heroic, we are face to face with an injury of grave import that proves fatal in a large number of cases if neglected.

TRAUMATIC SURGERY OF THE HEAD.

BY W. U. COLE, M. D., OF COLUMBUS, OHIO,
Chief Surgeon Hocking Valley and T. and O. C. Railways.

In the case of traumatism from which the head has directly suffered, if the degree of injury is such as to demand the attention of a surgeon, there are several points by way of diagnosis that it is well to bear in mind: The apparent degree of injury should be first considered, as to whether there be a simple abrasion of the skin, a contusion of the tissues or an incision or laceration that extends through the skin, muscles and other soft tissues of the scalp, down to and including the periosteum. Then there is another class of cases in which any, all, or none of these conditions may be present, and the contour of the skull has been interfered with by some break in its continuity. Then the form of fracture should be carefully ascertained as to whether it is stellate, lineal or punctured.

Consideration should now be given the extent of injury, if any, to the meninges, and also as to the kind of injury, that is whether at point of fracture. The meninges may be contused, incised or lacerated. Then consideration should be given the gray matter of the brain. If damaged and the amount of damage it has suffered, and the influence such damage may exert over the cerebral functions.

Further consideration should be given with

regard to the phenomena apparent in connection with the general nervous system, and its special functions. Impairment of special senses; general expression of the face; condition of the eyes, as to whether the pupils are regular or irregular. Investigation of the hearing of each ear, as to whether the hearing is normally acute, and if there is a discharge from the ear, the character of the discharge. Respiration should be studied as to volume, rhythm and time. The character of the heart action should be carefully noted. Perspiration should be noted, as to whether abnormal in quantity or apparently absent. The activity of the reflexes should be noted. The arms and legs should be investigated, as to whether paralysis to any degree exists. During the investigation so far, a close watch should be kept for other injuries that may have been acquired to the face, trunk and extremities. Careful consideration should be given the genito-urinary tract, as to involuntary discharge or suppression of the urine, and if the urine is voided or catheterization required. The character of the urine should be studied, as to whether it is normal in consistency or if other fluids may be present. The functions of the bowels should be investigated to ascertain if paralysis exists, and if there is retention of the feces or not. If vomiting occurs, the dejecta should be carefully noted, as to whether they contain blood, or other fluids in excess. The thermal condition of each member of the body should be noticed.

TREATMENT. (INITIAL.)

The treatment to be adopted in cases of injury to the head depends largely upon the kind and amount of tissues involved. If only a small wound, surrounded by contused tissue ex-

ists, the hair, from an area of at least 2½ inches in diameter, should be closely shaven, and thoroughly washed with sterile warm water. After the vessels have been ligated, if such is found necessary, a small piece of sterile gauze may be placed over the wound, and the gauze may be held in place by narrow adhesive straps, so placed as to also hold the edges of the wound in coaptation. If there is no marked retraction of the wound edges, a complete immersion of the injured surface with flexible collodion, such as will form a provisionary scab, is often the extent of treatment such a wound will require. A mere contusion of the scalp requires but little surgical attention, outside of the initial examination. If, however, there is one large, or a number of gaping incisions, that may be complicated by extensive lacerations, an area, at least 2½ inches distant from the outer margins, should be closely shaven, and after thoroughly washing with sterile warm water, to which an antiseptic may be added, the edges may be coapted with catgut or other appropriate sutures, and a proper dressing with a bandage for retention may be applied. I have never found it necessary to apply drainage to scalp wounds.

Injuries to the periosteum, in connection with wounds of the scalp, unless very extensive, are usually of but little import, and soldom require special attention. Injuries to the muscular layers do not demand special attention, as a rule, on account of the limited functions of these muscles.

In case a compound fracture may exist, the treatment must depend entirely upon the nature of the fracture. However, in every case that there is reason to suspect the presence of a fracture, whether there are microscopic

lesions of the soft tissues or not, the hair should all be shaven. No harm can come from the procedure, as the cosmetic effect may be soon overcome by a new growth of hair, but decided benefit may be appreciated, as such affords an opportunity for direct inspection as well as to facilitate the application of thermal agents and protective dressings. If a linear fracture is found to exist alone, and the margins of the bones are coapted, unless there be some systemic manifestation which leads to a conclusion that operative intervention is justifiable, the wound should be closed the same as a simple scalp wound, except that drainage should be inserted over the entire portion of the line of fracture that is exposed to view. This should not be left more than twenty-four hours and should be replaced at each subsequent dressing as long as such is deemed expedient.

Occasionally violence may produce a concavity in both outer and inner tables, and the outer one, owing to its greater elasticity, may soon regain its normal contour, leaving no visible trace of fracture, but the inner table, owing to its greater degree of fragibility, may still retain its concavity, which usually represents an area of stellate fracture. In such cases the fracture may be entirely overlooked until pressure or other local or constitutional manifestations point to the necessity of operation. If the fracture is stellate and comminuted, after rendering the wound thoroughly aseptic, with the appropriate use of sterile warm water, the depressed fragments should be elevated by the assistance of a properly designed lever. To facilitate this, a small portion of bone can be pinched from the outer margin in order to allow passing of the lever into the cranial cavity. I do not approve of

the fixed operation for trephining in this class of cases, inasmuch as it adds injury to injury by multiplication of fractures, and thus augments the hazard in each case.

If portions of bone are found completely detached, they should be removed from the wound and may be submerged in a mild aseptic salt solution, to be replaced before closing the wound, if the operator deems this advisable.

If damaged brain tissue is found to exist, this should be dealt with as one would deal with other soft tissues. Absolute cleanliness should be paramount. All foreign material should be removed and hemorrhage arrested; small fragments of bone can be detached, or perhaps if still attached to seriously lacerated and apparently devitalized tissues, they should be removed from the wound. If the meninges have suffered laceration, and if the rents admit of stitching, a very fine sterile catgut suture may be used for coaptation, but care must be exercised to leave proper drainage at the most dependent portion of the wound.

If, however, there be no laceration or other serious abuse of the meninges and no serious lesion of the brain apparent, that demands immediate operation, after proper elevation and arranging of the fragments of bone has been accomplished, the scalp wounds may be closed as referred to heretofore, and proper drainage, preferably plain sterile gauze, should be inserted. All punctured wounds of the brain should be thoroughly washed out with sterile water at a temperature of 100° Fahrenheit, and all foreign bodies removed, when such is practicable. (I do not believe it proper to use an antiseptic other than sterile water, at a temperature of about 100° Fahrenheit.)

As it is true that a chemical solution, in or-

der to have germicidal value, must possess sufficient power to coagulate albumen, certainly it is not wise to bring such a fluid in contact with so delicate a tissue as the brain. And, it must also be said of an antiseptic, that it must have sufficient power to arrest cellular activity in order that it may possess a so-called antiseptic value. I believe it proper that the water should be distilled, as well as sterile, in order that it may contain no salt or other material which, when brought in contact with a delicate cellular substance, is capable of producing deleterious effects.

The person with a fractured skull should always be placed in a recumbent position, with the head on a plane with the trunk and extremities, and should be, if possible, made to rest on a comfortable couch. The room should be kept dark and well ventilated and at a temperature of about 76° Fahrenheit, and no one should be admitted except the nurse and the attending surgeon.

Thermal applications may be applied to the head continuously, at intervals, or not at all, as conditions may demand. If the patient seems to repulse such applications, as his efforts will produce worry and restlessness, which may be productive of harm, they should be discontinued. An opiate may be given, preferably hypodermically, to relieve excessive pain. Liquid food, that may be selected for the individual case, should be given at proper intervals, and if administration of food by the mouth is impracticable, a proper quantity, preferably predigested, should be given by the rectum. Occasional sponge baths of milk and alcohol (equal parts), are often of marked benefit in producing rest, relieving excessive tem-

perature, and will also serve, to a degree, as nourishment.

Respiration and circulation may be supported by strychnia, atropia or other suitable tonics, if such stimulation is found necessary. External heat may be applied to the body, if the amount of shock may require it. The bowels should be kept open with saline cathartics, and cartheterization should be performed, at least every six hours, if there is retention of urine.

If the injury is so located as to produce ecchymosis of the eyes, due to gravitation and diffusion of blood, a hot boric solution may be applied with much benefit.

The first dressing should not be allowed to remain more than twenty-four hours, and the drainage should always be removed at time of first dressing. Drainage may be reinstated at each subsequent dressing until such time as it is no longer required.

The patient should never be left in his room alone, as consciousness is often suddenly restored with impaired mental faculties and the patient is liable to suffer accidental or self-inflicted injuries. This being true, all drugs of lethal potency should be kept out of the room.

The effects of injury to the head where the brain continuity is interfered with, may be classified as immediate, secondary and remote. This classification admits of criticism, but will answer present purposes with some precision.

The immediate effects usually are partial or complete loss of consciousness. Some of the reflexes, however, are to a degree normal. If the patient is partially conscious, the special senses are usually impaired in their functions, and owing to changes that are not uncommon,

some of the functions never regain their normal equilibrium. If there is some degree of consciousness, the subjective mind will be more or less active and the patient passes through a successive panorama of dreams.

I am convinced that the primary condition produced by violence to the head, that is followed by unconsciousness or arrest of cerebral functions, either partial or complete, is due to disturbances of molecular activity, and that this is induced by the vibration which follows the violence.

All mental activities are associated largely, if not completely, with molecular mechanism. Any mechanical violence that seriously disturbs the cellular equation of cortex activity, will at once inaugurate depreciative consciousness, in progressive intensity until consciousness completely vanishes or is fully suspended, and the degree of suspension is in proportion to the intensity of the vibratory wave.

In complete suspension of cerebral functions, objective life to the injured is not maintained. The identity of the ego is no longer under control and we say, with a degree of certainty, that cortex life is no longer conscious.

Violent force applied to the skull transmits to the cells of the cortex organism such a degree of wave force as to naturalize the normal equation of mechanic, chemic and nutritive activity of the cortex. The degree of vibratory force may be only such as will produce temporary suspension, or it may be of such a degree as to terminate the normal reciprocity between physical, chemic and molecular activity and conscious life.

The degree of violence may be sufficient in intensity to break up all thought essence activity which is basic to all rational conscious-

ness. I am convinced that detail research, with a view to explanation of physical and mental phenomena associated with injuries to the head, will produce many interesting and advantageous topic for consideration.

Each cell contains a mass of small branching fibres or dendrites and large axial fibres or neuraxon. The cell with its fibres is called a neuron. The molecular movements are in the dendrites toward the cell and in the neuraxon, from it, or in other words, their forms of motion are afferent and efferent.

It is said that in this equation of motion we have the physical basis for psychic acts. It is then reasonable to suppose that if the afferent and efferent vibrations are normally equated, consciousness is asserted. But, if this equilibrium is seriously disturbed by a vibratory wave from without, it naturally follows that unconsciousness will result.

Occasionally is is apparent, however, that all objective phenomena may for a time be lost, yet expressions may be shown by the patient which seem to rise from subjective activity to emanate from sub-conscious life.

The objective mind may be wholly impaired or may become acute by rousing up of the patient. He will frequently manifest an apparent recognition of persons about him, but he does not have sufficient power of discernment to call his most intimate friends by name. Occasionally they may show signs of recognition, to be followed immediately by absolute denial of any knowledge of the person alluded to.

Structural complications of injury to the head. Formation of aneurysms, as result of rupture of coats of the arteries, may be extra- or intra-cranial or both.

Death of bone, due to cutting off of blood

supply, or from pressure, or perhaps from denudation of the periosteum, may occur. Osteomyletis following contusion of bone is rare, and I am impressed that its development is due to either auto or recently acquired infection. This complication should be treated by modern antiseptic methods, and if nocrosis occur, the decayed bone shauld be removed as early as possible after detection, in order to avert a possible meningitis.

Purulent sub-cranial necrosis is almost sure to be followed by meningitis, due to local infection. I believe immediate operation justifiable, as great benefit may be derived from the drainage that is produced by operation.

Abscess should not be allowed to form, but should the existence of an abscess be discovered, the abscess should be immediately drained.

I. Concussion: I am impressed that this condition, which is characterized primarily by loss of consciousness or an arrest of cerebral functions, is due to molecular disturbance, produced by the vibration that follows violence.

If suspension of the brain functions is prolonged, I believe the continuance due to small rents in the brain substance, with rupture of small vessels and formation of thrombi, and I am also satisfied that a general cerebral ecchymosis is not uncommon.

Patients with severe concussions who have come under my observation have not, as a rule, shown immediate evidence of the mind having returned to its former equilibrium, on first regaining consciousness. It is not uncommon for them to lay semi-conscious and, when aroused, show a degree of rationality, to finally arouse at the end of a week or ten days with the cerebral functions seriously impaired. Such condition, however, usually shows a gradual im-

provement for two or three months until the mind seems to have regained its normal status.

Frequently it is true at first signs of consciousness, the patient will not know his own name, nor has he any idea of location or direction. Sometimes, however, this state of mental functions becomes permanent, and the patient never shows further signs of normal mental stability. If the patient is suffering from latent infectious disease, serious intercurrent cerebral disease may supervene to produce troublesome sequelæ.

A relapse after consciousness has once been gained, does not necessarily mean dissolution. With proper food and modern nursing, conditions will often change for the better after the patient has been comatose for a number of days.

II. Contusion: I am convinced that it is no easy task to differentiate between concussion and contusion. However, in simple concussion the entire brain substance, to a degree suffers alike, while in contusion various localized areas may be speedily affected. At a point of contusion there may be but little appearance at first of injury, but after a few hours the general symptoms become visible, as is frequently true in other contused tissues of the body. In contusions the lacerations in the brain tissue are often visible microscopically. Larger blood vessels have given vent to their contents and extravasation of blood, with formation of clots, is more profuse.

I am impressed with the fact that cases developing encephalitis (where contusion exists), are invariably sufferers from auto-infection.

Where compression exists to a visible degree, it must necessarily follow in conclusion that such is due to the pressure of some form of foreign material, that by its pressure produces

such tension on the contents of the cranial cavity as will interfere with the brain functions. This condition may be produced at time of injury, and if secondary is usually by accumulation of blood or other fluids.

If the tension is sufficient to restrict the calibre of the blood vessels, as a natural consequence, death will ensue. If there be a local lesion involving the center of circulation, the circulatory system may become so embarrassed that death is imminent, or if the respiratory centers be likewise invaded, death is sure to follow. It is estimated by good authority that from 1-5 to 1-10 of the cranial cavity may be occupied by foreign material before death will occur, unless the pressure is direct upon some of the more important nerve centers. A few marked symptoms of brain pressure may be of interest.

Respiration is slow and stertorous and is sometimes irregular, both in rhythm and volume. A peculiar puffing sound is noticable on exhalation, due probably to pressure—paralysis of the muscles of the face.

If the patient falls to the ground after injury, he usually turns face downward and will remain for a time in this position, if unmolested. Occasionally it is true that he will resist interference immediately after the injury, and will recite short sentences audibly.

If placed on his back, he usually becomes comatose. The pupils may be responsive at first, but later become, to a degree, fixed, though the condition as to regularity or irregularity is dependent upon the location and extent of injuries. Paralysis of a few or many of the muscles may be present. The skin over the muscles that are not affected is frequently hyper-sensitive in the initial, but this gives

way to decided dulness of sensation as the nerve functions become depressed by general failing of vitality. If the paralysis be due to accumulation of blood or other fluids, paralysis will be gradual in its onset, and its progress depend on the amount of fluid collected.

Should the flow of fluid be arrested and absorption take place, the affected muscles will regain their functions in accordance with the degree of rapidity in which the pressure is removed.

Many serious traumatic brain lesions may recover, providing some form of infection does not supervene to establish a form of encephalitis, which is so commonly fatal.

Manifestations of remote effects of injury to the head may follow closely the condition produced by the injury, or may be delayed for months, and perhaps years. Impaired memory is often a remote effect, but frequently recovery is complete, if other conditions are favorable.

Power of speech may be lost for a time, but is usually regained. The injured person may sometimes talk at random, but at other times rational. If the sense of hearing is changed, not uncommonly it is true that persons who have suffered impairment of this sense, prior to injury, will have apparently normal hearing for a time after injury, but usually this acuteness subsides, followed by a greater degree of dulness than was apparent previous to the injury.

Irritability of temper is a common sequel and is sometimes continuous through life. Cephalalgia may be continous or intermittent, and if intermittent the attack is usually nocturnal.

Insanity, if manifest, is not always permanent, but with proper restraint and quietude, a

wholesome diet and good air, with suitable environments, the patient will sometimes recover.

(I have in mind a case that became insane a short time after injury and remained so for over three years, followed by complete recovery.)

The appearance of traumatic diabetes is not an uncommon occurrance. Albumen may be present in the urine. Sexual excitement may be augmented, but is sometimes absent.

I am impressed that administration of drugs in this class of cases is, as a rule, useless, so far as curative effects may be anticipated. The removal of the source of irritation should be practiced when such operation is deemed justifiable.

III. Remote effects of injury to the eye and ear: Complications that may arise in injury of the head, to affect the functions of the eyes and ears, are numerous, but a few of them are worthy of mention at this time, although the writer will not go into detail.

The auricle may be partially or wholly destroyed, or so seriously mutilated that the remaining portions will leave but little trace of the general contour of the organ. Specialists advocate various plastic operations for the repair of these conditions. Certainly the character of the operation must be determined by the existing condition in the part that has suffered. It is fair to say—if we are to judge from cases recorded—many good results have followed from repair of these organs. When there is a fracture of the temporal bone and particularly the petrous portion, in which the delicate factors of the function of hearing are incased, we frequently find impairment and occasionally complete loss of function, which as a rule is of short duration, and the hearing

will attain its normal degree of acuteness as convalescence takes place. In exceptional cases, however, where serious injury to the nerve follows or when pressure is made on the auditory nerve, by clots or growth of bone or other tissues, which may undergo an abnormal development, we may have either partial or complete loss of hearing, uni or bilateral, and such may be permanent. Various forms of injury to the eyelids are common, but the modes of repair in these cases are too well known to warrant comment. The eyeball may be so lacerated as to allow the contents to escape, and, as a rule, excision of the remaining portion of the eye is necessary. Occasionally, however, when there is no apparent injury to the ball and no noticeable interference with vision, remotely from the time of injury, a cataract may develop and interfere seriously with sight. Traumatic iritis is a very common complication and is frequently due to auto-infection, and no impairment of vision results. Injury to the soft parts about the eye does not need special attention and should be treated the same as injuries to other tissues.

The presence of foreign bodies in the cranial cavity is capable of decidedly influencing the moral tendencies of the person.

For instance, Mr. B. S., a soldier of the civil war, having an amiable disposition prior to his enlistment as a soldier, returned home with his moral conduct so altered that his immediate family finally, after numerous attempts to reform him, renounced him. He wandered from one soldier's home to another, not being allowed to remain at any one of them a great length of time, on account of his dissolute habits. He did not respect the truth, stole, drank alcholics, told marvelous tales of exploits

and often declared that he had a ball in his head, which statement was not believed. A necropsy subsequent to his death, in 1901, revealed a bullet, so located between the two hemispheres of the brain, that it did not at any time produce motor or sensory symptoms.

Case 2. A carpenter, aged 30, was struck on the head by a piece of timber and rendered unconscious for several hours. The accident occurred in 1885. Prior to the accident he was sober, industrious and used good judgment in the management of his affairs. Three months after the injury, his moral conduct began to gradually change, and the change was progressive until he became a moral wreck. Five years subsequent to the injury he died suddenly, at a charitable institution, and a postmortem revealed a piece of steel nail, 1½ inches long, imbedded and encysted. The tiny opening in the skull produced by the nail at the time of injury was overlooked, as there was marked contusion of the extra-cranial soft tissues.

BLIND FISSURES OF THE SKULL.

BY IRA B. BARTLE, M. D., OF AUGUSTA, OKLA.

The title of this paper is a misnomer, but it is as near what I wish to express as any I could bring to mind, and it is probably no more of a misnomer than the rest of the paper will be—a ramble over an important subject.

I choose this subject because I have had 3 cases where there were none of the characteristic symptoms of the affection, guide posts with the finger pointing to a localizing area. Where you almost suspect concussion, of a severe form, with no other or more serious sequelæ.

My first case was a boy of 7, who fell from a horse, slightly bruising the left side of the head. Had pressure symptoms with pulse of 42, temperature 98°, and respiration of 10. No paralysis of either side; pupils dilated; able to talk, but no reason or memory. This was seen in consultation and I advised an exploratory operation, but was refused. Next day the pulse had risen to 50 and respiration to 12, where they remained for 3 days, when an operation was permitted. We have a horseshoe incision on the right side, from 2 ctm. behind the lobe of the ear to 3 ctm. back of the eye. Found a fissure fracture extending from the superior longitudinal sinus nearly across the parietal bone in the anterior portion. No compression, no displacement. Applied ½-inch trephine behind the center of the fracture. Found but a slight hemorrhage, which we re-

moved. The patient came off the table normal and remained so until complete recovery. I am at loss to explain the pressure symptoms, as the extravasated blood was very slight. Perhaps 5 ctm. in thickness by 3 or 4 ctm. in extent. However, after the removal of the clot the patient remained normal.

Case No. 2 was a man of 78, wounded on the left side of the head (about 3 ctm. in front and 4 ctm. above the ear) by the accidental discharge of a shot gun, carrying away the scalp and denuding the skull. There were pressure symptoms, pulse 46, respiration 12, temperature 97°. Unconscious and a partial general paralysis; incontinence of urine and feces. There was no fracture of the outer table; operation was denied. In 3 days the paralysis began to disappear, except in the left hand and the tongue. Pulse, temperature and respiration became normal on the 5th day, and by two weeks the patient was apparently well.

About six months later he had an epileptiform seizure, which have recurred every week or two, and an examination under the X-ray showed a fissure (or, better, a furrow) fracture of the inner table, with thickening. The patient is not now under my care, so that I can not give the outcome.

The third case was a man of 28, working for the K. C., M. & O. R. R., who was caught in the cyclone at Carmen May 22 of this year. I found him in an overturned box car, unconscious, bleeding from the nose and throat, and vomiting. Unable to talk, but able to walk. Gave him sedatives and moved him to the depot. The next day the bleeding and the vomiting had stopped, he was able to walk around, but could not talk, and we could not ascertain his name. Had him moved to the hospital at

Augusta, keeping him under medication. There were no scratches on the body and no bruises on the head. Pulse ranged from 40 to 56; temperature about 97°; respiration about normal. The appetite was inordinate, but he could not speak a word; reflexes were normal. The nurse began teaching him and he learned a few words; however, there was no memory. Thrice, when I had ordered his breakfast withheld so that I could operate, he climbed over the transom and went after food. On the 12th day after the accident I made an exploratory incision on the left side. There was absolutely no sign of trouble on this side more than the other, there being no paralysis. I made a horseshoe incision, beginning about 4 ctm. behind the lobe of the ear and ending about 3 ctm. above and back of the external canthus. We exposed a fissure fracture extending from the sagittal suture downward to about 5 ctm. above and in front of the ear, crossing the coronal suture and ending about 3 ctm. above the center of the left orbit. There was no displacement, but an oozing of blood. We applied a ¾-inch trephine at the angle of the fracture, just back of the coronal suture and removed a button, finding a clot about 2 ctm. in thickness, which we removed. There was no laceration of the dura, and the bleeding had been from the anterior meningeal artery. Put in iodoform gauze packing and closed the wound. There was oozing for two days, and quite a severe hemorrhage on the third when the packing was removed. A fresh packing was replaced, after which the bleeding ceased. Patient became normal on the table and began swearing. The recovery was uneventful and complete. The 12 days which elapsed between the accident and the operation are, and always

will be, a blank. I have a letter from the patient, in August, which says he is feeling well. So, you see, the operation was a success. The peculiarity of this case was the lack of any localizing symptoms. The reason I assign is that the clot lay too far in front to affect the vital centers, hence also the lack of intellectuality. For the only sense that the patient displayed was nicety in his choice of food.

(Since the composition of this paper a case came under observation of a boy thrown from a horse, with a fissure fracture of the base, with bleeding from the ears and throat. The patient recovered with little trouble, becoming normal on the third day and remaining so. Dr. Graves, of South McAllister, reports a similar case, which recovered without operation. In neither of these last cases were any clots detected.)

HEAD INJURIES.

BY J. F. PRITCHARD, M. D., OF MANITOWOC, WIS.

"Head Injuries" will mean in this paper the head proper as distinguished from the face, and also my own personal observations, only not attempting to give any of the anatomy, physiology or pathology, with all of which you are familiar. I have also perhaps adopted a somewhat unusual division of these injuries, making them one of degree rather than of kind; for the reason that it seems more natural and makes them easier to describe. For purposes of this paper then I would divide injuries of the head into three degrees.

First—Scalp wounds, or injuries not involving the skull or brain.

Second—Injuries of the skull, with or without injuries to the scalp.

Third—Injuries of the brain, which may or may not include the other two.

Scalp wounds or injuries of the first degree may be dismissed in a few words. In nearly every instance healing by primary union when the first dressing is properly applied. is to be expected, it is almost a stigma on the surgeon if he fails in obtaining this result. Occasionally, however, when the flaps are so nearly destroyed as to slough, these wounds require the greatest care in dressing and asepsis to prevent disaster. I have seen but few septic wounds of the scalp, and it is a notorious fact

that septic wounds occur but rarely in railroad injuries, owing, no doubt, to the lack of germs due to the peculiar environment of a railroad and from the large amount of burnt cinders.

They have appeared in my experience only in private cases when there had been an attempt at home treatment, or when the attendant did not appreciate the need of cleanliness. In one case of erysipelas and death the wound was caused by a blow on the vertex with a billet of wood taken from the street. A murder trial was the outcome, and at the post-mortem we were able to trace the direct extension of the external inflammation to the meninges as the cause of death. In other cases of infected wounds of the scalp recovery has been the rule. When sloughing occurs in scalp wounds the need for extreme care is apparent. In one case there was complete loss of substance of the scalp for the space of three or four square inches, leaving the bone completely denuded, yet this granulated and the bone became covered without exfoliation, and a good result followed. In this case the man lived many years and died from other than brain disease.

The primary dressing is made with proper cleaning—shaving the scalp completely, washing with alcohol (preferably wood alcohol) and then applying sterile gauze moistened with this alcohol for a day or two, or until all probability of infection is passed. The compound tincture of iodine is used for stimulating granulations and later antiseptic treatment if needed. These two antiseptics in my hands have always given good results and are easily obtained, so that they are used by me almost to the exclusion of all others for the treatment of all wounds.

Injuries of the second degree are of great importance from their probable remote effect in causing disturbances from faulty position of fragments, and thus secondary pressure effect on the brain, or from extension of septic or inflammatory action to that organ. Every skull injury, whether complicated by scalp wound or not, should be carefully investigated, and if a fracture be found, should be treated according to recognized principles. You may question whether there can be a fracture without injury to the brain, but I have seen cases of this nature; as, for instance, a young man was struck on the top of the head, at the junction of the ascending and horizontal portions of the frontal bone, by a heavy weight falling from a height. No injury to the scalp but depression of bone, there was no disturbance of mentality, and in operating he was able to direct and give his consent. We removed several pieces of bone and elevated the depression. This case afterward was litigated for permanent injury, which could not be shown.

It is scarcely necessary here to reiterate what was said regarding the scalp as to cleanliness, which means asepsis, of course, as the danger is multiplied many fold when we open the cranial cavity. The best method of preventing unsightly and dangerous after-effects from loss of bone substance is well stated in a paper by Dr. Owens, read at the session of this Society last year, in which he advocated replacement of bone fragments where there is much loss of bone substance. This plan is always safe, if care be taken in preventing contaminations of the fragments, and it should in every instance be carefully considered. It is needless to state that I would not use the same antisep-

tics in cases requiring operative measures on the skull or brain as on the scalp, although I would carefully treat the scalp wounds if existing with these antiseptics before making an incision, and in the after-treatment nothing but dry sterilized dressings should be necessary.

In closing this part of the subject I would say, while these simple fractures may and do occur, yet they are so few that they are almost without interest except as to the prevention of other and more serious disturbances of the sensitive structures underneath.

The important part of the subject of head injuries is injuries of the third degree, in which the brain, its membranes, or its circulatory system, is involved. We here reach a subject that has caused much controversy as to what is best and safest in treatment. How much or how little to do, or whether to do anything; but quoting from a surgeon of long ago, "There are no injuries of the head that are too extensive to be despaired of, and none too slight to be ignored," and in pursuance of this idea how frequently we have found carelessness in the management of these injuries in which the injunction above quoted is ignored in both directions. In the first place, the surgeon seemed to think that an injury was so slight as to need no attention, and in the second place that the destruction of tissue was so great that it would necessarily be fatal, thus plainly neglecting his duty in both instances. Such neglect is little short of criminal, and he would make a sorry figure if required to answer for such negligence in court and before a jury.

Injuries of the third degree involve all of the complications of diagnosis that can be found about the head, and it requires accurate knowledge of the anatomy, physiology and

pathology, in fact all of the various phases of many brain diseases that we meet with in making a reasonably accurate diagnosis of brain injury. We have seen insanity developed from these injuries, also epilepsy, various forms of neurasthenia and hysteria, in fact we can and do have such a multiplicity of troubles, both real and imaginary, from these injuries there is some excuse for errors in diagnosis on the part of any surgeon. The important question, however, for the railway surgeon is to know what to do at the time of the injury, and to make a sufficiently accurate diagnosis of the various forms of brain lesions. From the slight stunning from a fall or blow on the head, to the complete disintegration by severe concussion; from compression caused by depressed bone, or compression from rupture of a bloodvessel and the attendant formation of clot; also, whether the injured man is suffering from a head injury, or whether it may not be from the inevitable whiskey bottle which always appears mysteriously from sources before considered above suspicion until called out by an accident; whether the injury, if existing, is of a nature requiring heroic treatment or no treatment. All these questions confront us in such situations and demand an immediate answer.

Assuming a case (and we might take one of many) where the injury is palpable, what first? Always before examining the head be careful not to disturb the clots of blood if the scalp be wounded until you are prepared to give the patient the most thorough and painstaking treatment. Merely a gauze pad moistened with a solution of some mild antiseptic, until you have yourself and surroundings thoroughly and carefully prepared.

I am now relating a case which was actual,

and will be somewhat illustrative. The hair is one of the greatest troubles, and it should all be removed over the whole head, the scalp carefully shaved and scrubbed and every care taken to avoid disturbance of the wounds. When all was ready a careful exploration of the head showed several scalp wounds that had not been seen previously. (This patient had been struck by a fast passenger train on a crossing and thrown nearly 100 feet.) These wounds were held open and thoroughly cleansed by irrigation and sponging, avoiding the use of the fingers if possible, using only instruments that are sterile. Only one wound showed a depressed fracture, which was elevated, small and loose pieces of bone removed and the wounds dressed with moist dressing as an extra precaution. This patient was totally unconscious for the greater part of two days, but recovery was practically complete in one week. This case was treated in a little country village, with none of the hospital advantages of the city, and without a trained nurse and only ordinary assistants; but it illustrates the fact that good surgery can be done under adverse circumstances, always having a proper regard as to the need of caution in our management, in order to avoid infection, which is of more importance than the injury itself in most instances.

If our patient be unconscious, and we have no scalp wounds or evidence of bone injury, what is the proper course? In all cases condition from every bearing is studied, and when in doubt apply the time card rule, "Take the safe course." That is, if there be no probability of determining on the spot as to what causes the unconsciousness watch and wait (and I might say pray), but watch and study

carefully for lights which will surely dawn, and in the meantime no harm is being done. In one case in which slight scalp wounds and no bone injury were found at post-mortem, there was found disintegration of brain tissue. Active intervention in such a case would have been of no advantage to the patient. In another case we looked for and found a fracture, with clot directly underneath, though this man died from the severe concussion; yet we were justified in operating, because we could with considerable probability make a diagnosis of the condition existing and there was hope that if the condition—which was due to increasing pressure—could be relieved he might be saved. Another condition occasionally met with is outlined in the following case: Brakeman fell from a freight train and was not missed until the next station was reached. On search being made he was found sitting on the bank at the roadside in a dazed condition, which soon developed into insanity of maniacal type. No attempt was made at operative intervention. He was soon after sent to an insane hospital, where he was cared for and recovered. We never were able to get a connected history of this man's antecedents, and whether the insanity was due to shock, fright, injury or hereditary taint was impossible to determine.

Another type in which the patient's head was badly lacerated had a large open wound by which the brain was laid bare, fragments of bone were driven into the brain and the meninges badly torn. This wound occupied the left lateral surface of the frontal lobe. The bone was comminuted and the scalp extensively lacerated. All care was taken as to cleansing and dressing, all loose fragments carefully removed, and with gauze sponge the brain sur-

face was cleansed and restored to its proper place, hemorrhage was controlled, and careful compression applied. He was put in charge of a competent nurse; he apparently did well for about twelve hours, when a secondary hemorrhage occurred suddenly, and he died in a few minutes. This case is given as an illustration of one of an extremely severe type, and in such cases we should feel that we did the best for the patients even if they do not survive.

After the above brief outline of a few of the many types of head injuries and their surgical treatment, what becomes our duty when there is development of serious nervous disturbance following immediately upon an injury? Motor and sensory paralyses are among some of the forms of this disturbance, yet if we can not locate depressed bone or other skull injury, are we justified in exploring for it, basing the location of the operation on the part subject to paralysis? How are we to distingush hysterical from real paralysis, especially with the prospect ahead of pecuniary compensation being in proportion to the amount of alleged injury? To distinguish hysterical from real paralysis, Patrick, of Chicago, in his address at the last meeting of the Wisconsin State Medical Society, formulates the following:

In hysterical paralysis the line of anesthesia is constantly changing, and does not follow any known anatomic distribution of nerve supply. This is one of the most valuable suggestions that could be made, as it serves to throw light on brain injuries and also on all other injuries of the nervous system. This examination is easily made and Patrick says it is always positive, as the patient can not remember just where the line is, and it will change so rapidly that one can not fail to detect it. This

method is of great value in medico-legal cases as well as determining what to do in our cases of head injuries. When, however, we have positive indications locating clots or depressed bone, then it becomes a duty to at least attempt to relieve the disturbance by operative measures. A question arises, however, Is the surgeon who is so located that he can not have the advantage of a well-equipped hospital justified in undertaking these delicate operations? I think if he possesses the requisite knowledge to locate the injury, he certainly needs only courage to relieve it. He can make these operations as well at a private house as in a hospital, only it will be so much more burdensome to the surgeon as he will be obliged to supervise every detail of the procedure. No one surgeon has a monopoly of operating and I have seen as creditable work done outside of the hospital as in it; all depending on the operator. With reasonable care there is no more danger in opening the cranial than the abdominal cavity, and in neither is there as much danger as in resetting a knee joint or removing a varicose vein. We hear a great deal about abdominal surgery because it is easy and much eclat is attached to it, but we hear but little about brain surgery because of the difficulties attending the removal of the bone to reach the seat of difficulty, yet the latter is quite as easy and the results are more often advantageous. It would all seem then to resolve itself into the adage of "When not to operate." In conclusion, then, I can do no better than to sum up.

First—All injuries of the head, no matter how slight or how serious, must have the most careful attention and the best surgery.

Second—Never use antiseptics or fluids in-

side the cranial cavity, reserving such treatment for the outside of this cavity only.

Third—Always operate if there is a probability of doing good, and remember to at least never do harm.

INJURIES TO THE SPINAL COLUMN.

BY JOHN E. OWENS, M. D., OF CHICAGO.
Chief Surgeon I. C. and C. & N. W. Rys.

Case 1. A. O., age 41 years, a section hand, on November 21, 1902, was injured in the following manner: While riding in a freight car and sitting on a railroad tie a pile of ties behind him were thrown down upon his back, and by their weight and the force of the fall pushed the upper part of his body violently forward as far as the knees. Dr. H. E. Paine, of Dixon, Ill., saw the patient in 15 minutes after the accident and found complete loss of motion and sensation below the seat of the lesion. Deformity involving the ninth, tenth and eleventh dorsal vertebræ was very marked. There was hemorrhage in the surrounding tissues. Shock and considerable pain in the back was severe.

The patient was immediately removed to the hospital by Dr. Paine, and on further examination the above diagnosis was verified. Marked swelling of the tissues on each side of the spine in the location of the injury was observed. The paralysis involved both rectum and bladder. The treatment consisted of partial reduction of the fractures by extension and counter-extension; no operation was performed. Incontinence of feces still exists, although there has been a return, in a certain degree, of the action of the sphincter ani. The use of the catheter was required until April 1, 1903. Ten

weeks after the accident muscular action appeared in the extensor muscles of the thighs, irregular in character, essentially a quiver of muscles. Slowly the muscular power developed, together with sensation, until free voluntary control of the muscles of the thighs resulted. Paralysis of the muscles below the knees still exists, extension and flexion of the feet being absent. Apparently the fractured vertebræ have become consolidated, deformity being present. The patient is now (September 28, 1903) able to turn to one side or the other from the dorsal position. The bed sores are not extending, and they have improved.

July 1st the patient was allowed to sit up. Since July 15th he has occupied a wheel-chair as much as he desires. His general health is excellent. On account of the paralysis of the feet he is debarred from using crutches. Consequently he is confined to his bed or chair.

Case 2. C. E., 34 years old, was injured October 7, 1902, in consequence of having fallen in front of a moving handcar, the car passing over him. He sustained a fracture of the fourth, fifth and sixth cervical vertebræ and an axillary dislocation of the left side. The injury was immediately followed by complete paralysis below the point of the spinal lesion. Laminectomy of the fifth and sixth cervical vertebræ was performed at St. Mary's Hospital, La Salle, Ill., by Dr. M. J. Coveny, Spring Valley, Ill., and the presence of the fracture verified. The operation did not benefit his condition and he died about 24 hours afterward.

Dr. Coveny attended two other injuries of this character during the past year.

Case 3. G. Y., a driver in a coal mine, was caught between the top of his car and the roof

of the mine while seated on the front end of the car. His head was wrenched violently backward, causing a lesion of the third and fourth vertebræ, which was at once followed by complete paralysis below the point of injury. The man died three days after the accident, no operation having been performed.

Case 4. The next case was that of a cager in a coal mine. He had been in the habit of pushing the car on the cage with his foot. He was caught by the ascending cage and drawn upward some distance and then fell, landing head first amongst some timbers at the bottom of the shaft. The injury was immediately followed by complete paralysis below the point of lesion. An operation was at once performed and the broken laminæ and spinous processes of the fifth and sixth cervical vertebræ were removed, leaving the cord apparently free. The patient died one week after the accident.

Dr. Coveny is inclined to think that the damage to the cord and its membranes is so great in serious lesions of this character that an operation seldom does any good.

Case 5. P. K., about 40 years old, was admitted to St. Luke's Hospital, Chicago, July 3, 1903. The patient walked out of a window in his sleep, falling about 18 or 20 feet. It required a very careful examination to make out a slight prominence of the eighth dorsal vertebra. By means of digital compression an unduly wide space could be made out just above the eighth spinal process. The injury was followed by complete paralysis below the seat of the lesion. Sensation for heat and cold was lost. The patient complained of headache and severe pain in the back and in the neighborhood of the bladder. The maximum tempera-

ture, 105°, was noted on July 7th. He died August 7th. No operation was performed.

Case 6. May 8, 1902, G. G., 23 years old, having been run over by handcar, sustained a dislocation at the lumbo-sacral junction. The patient was under the care of Dr. W. H. Harrison, of Tutwiler, Miss. The doctor reported partial paralysis of motion and sensation of both legs; pain at the seat of the dislocation. There was considerable vesical tenesmus. The bladder, which was apparently paralyzed, was emptied by catheter of a large quantity of bloody urine. At the lumbo-sacral junction a sharp, bony prominence with depression just below and localized severe pain were noted. The doctor remarked that the loss of motion and sensation were not so complete as would have been the case had the dislocation occurred in the dorsal region. The absence of motion and sensation was so marked that the patient could not move his legs, and pinching or pricking was not felt. The blood had disappeared from the urine by the following morning. Fracture of the pelvis was not made out. The reduction of the dislocation was accomplished by two men pulling from the axillæ and two more from the hips, Dr. Harrison and an assistant pulling upward by means of a small pillow placed under the belly. The doctor reported that he saw and felt the reduction of the dislocation. He was inclined to the opinion that fracture did not exist. After the subluxation was reduced the patient promptly recovered the use of his legs; regained sensation. The dislocation was reduced on the day of the accident.

My inquiries concerning the injuries above noted brought the following report from Dr. Harrison: That there was a severe bruise

higher over the backbone and a little deformity in the nature of a curvature, which, in his opinion, was caused by the tearing loose of some of the group of erector-spinæ muscles and severe sprain of the back, but there was positively no other dislocation or subluxation. During the night after the operation was performed the patient got up unaided several times and had free use of his legs, and there has never been a time since that he could not handle himself. He has gradually become erect, but there is still some deformity about the ninth to the twelfth dorsal vertebræ. This deformity may have resulted from some previous accident or disease. At all events, the cord was not injured.

Case 7. R. A. H., about 35 years old, was admitted to St. Luke's Hospital, Chicago, June 15, 1903. He was injured June 13, 1903, by falling from the top of a car. The patient sustained a fracture of the arches of the first and second lumbar vertebræ. When admitted on June 15th his temperature was 100°, pulse 96, respiration 24. The accident was followed by paralysis of motion below the seat of the injury. There was absence of the plantar reflexes and of sensation in the left leg, but the right was hyperesthetic from the knee down. There was retention of urine for four days and then both incontinence of urine and feces set in. Laminectomy of the first and second lumbar vertebræ was performed on June 17th. A median incision was carried from the spinous process of the last dorsal vertebra to the fourth lumbar. Through the incision clotted blood in subcutaneous tissues was discovered, indicating the seat of the injury. Between the spinous processes of the last dorsal and first

lumbar vertebræ a pocket was found through which the finger could readily be introduced into the spinal canal. The arches of the first and second lumbar vertebræ were removed. The dura looked macerated and shreddy; pulsation of the cord could be felt. A large fragment of the arch of the second vertebra was removed. It encroached upon the cord on the right side. The edges of the bone were trimmed with a rongeur, so that no sharp points remained. Portions of muscle and fascia were trimmed. The periosteum was separated from the bone as well as possible and allowed to remain, as the periosteum, although somewhat ragged and irregular, helps to fill in the cleft with bony material. The cavity was filled with iodoform gauze until all bleeding ceased. The muscles and fascia were closed with buried catgut and the skin with silkworm. Iodoform gauze was placed over the wound and over this a large surgical dressing. The body was then inclosed in plaster-of-paris, reaching from the armpits to the trochanters. Eleven days after the operation the power of lifting the right leg was marked. Thirteen days after the operation a stitch abscess was discovered. Between July 7th and 30th, patellar and plantar reflexes appeared. The feet were extended. The bladder was under the control of the patient to some extent. July 11th patient held his urine from one to two hours, and he was able to lift the left leg from the bed. July 20th power of extending the leg was much increased. Temperature before the operation was 99.1, pulse 84. At 9 p. m. the same day the temperature was 98.6, pulse 116, but at midnight the pulse was 96.

June 22d all incontinence had ceased; urination voluntary; temperature normal. Consti-

pation required the use of injections. On July 1st the temperature in the afternoon was 101, and the maximum on July 2d was 100.6. On removal of stitches a stitch abscess was discovered, which continued to discharge for about a week. In a day or two the temperature reached the normal. As the left foot was still extended, plaster-of-paris was applied in order to keep the foot in better position—that of a right angle. July 21st a new plaster-of-paris dressing was applied. From August 12th the patient was up more or less in a wheel-chair. Strychnia and urotropin, attention to bowels comprised the medical treatment. Previous to leaving the hospital for his home a corset brace was adjusted to the back and an apparatus to hold the left foot at a right angle was substituted for the plaster-of-paris. The patient was discharged September 3d. He could get about with crutches, but was advised not to be too active for the next two weeks. Movements of both legs were excellent, except the foot drop on the left side. Hyperesthesia of the right leg had disappeared.

The following is the result of the operation: Complete control of the rectum and bladder, and also of the right leg; good control of the left thigh, but foot-drop persists in left foot. The urine was normal when the patient left the hospital. After leaving the hospital he was under the care of Dr. Goddard, of Harvard Junction. The patient wrote us on September 28th, asking for crutches, stating that he was quite strong enough to walk. He further informed us that the left ankle was getting stronger every day. His back felt as good as it ever did. He was able to remain up from 7 a. m. to 9 p. m. and does not get very tired, and he could almost stand alone.

There are many necropsies, which developed the fact that no operation could have benefited the patients. On the other hand, post-mortem studies have shown that operation might have relieved the patient. We all know that certain cases improve or recover without operation. Late operations are sometimes followed by satisfactory results.

Certain cases have an important bearing on the subject of early operation, and both early and immediate operations are more strongly recommended than formerly. Dr. Oscar J. Mayer reported a case of late laminectomy, 16 months after the fracture. Reports of other such cases are occasionally noted.

The injuries under consideration, when located below the first lumbar vertebra and when the traumatism involves only the cauda equina, seem more amenable to treatment than those above.

Like the nerves of the periphery, those of the cauda equina are resistant to traumatism. Whether compressed or divided, they recover as soon as the compression is removed or the severed ends united. Delayed operations are likewise here followed by better results. (Annals of Surgery, July, 1896. Samuel Lloyd.)

Physiologic evidence is in favor of regeneration of the nerve roots of the cauda equina. The absence of spontaneous recovery indicates the presence of a mechanical obstacle to recovery. Some cases will recover spontaneously—cases, probably, where there has been no extensive tearing of the roots. Thorburn is of the opinion that we should not operate here too early, say at the end of six weeks, if there has been little or no recovery, or if recovery has ceased. Too long a delay will result in sec-

ondary degeneration, which, of course, impairs the prognosis.

Recoil seems to be of much more frequent occurrence than is generally supposed. In a series of experimental fractures in 24 children and eight adults, where the cord was either badly contused or entirely severed the bones were found in place.

Post-mortem examination has shown that in two or three days after injury myelitis sets in and probably sclerosis, and in three or four months the cord has been converted into cicatricial tissue. This would favor early operation.

It is said that in favorable cases improvement begins by sudden and almost immediate return of sensibility. Motor repair is slower, but progressive from above down.

There is evidence to show that surgeons often do a sufficiently large and complete operation. It has been my practice to satisfy myself of the freedom of the cord from compression above and below the opening made by passing a probe upward and downward, of course outside of the dura. Hemorrhage is not particularly troublesome, except in the cervical region, which in one instance was followed by death in consequence of a lesion of the vertebral artery. Efforts should be made to preserve the periosteum, since Ollier has shown on dogs that, after a subperiosteal resection, a very good osseous canal has formed. Chipault (Lloyd's review, Annals of Surgery) has observed that in five children the same result was noticed. In three it was demonstrated by palpitation and in two by a postmortem.

Improvements in results must come from prompt and more extensive operations, the removal of all portions of bone that encroach

upon the cord, reduction through open wound, silver-wire suture when necessary and practicable, immobilization and a discontinuance of the use of the mallet and chisel in operating.

In dealing with fracture dislocations of the spine we should bear in mind those rules which guide us in the treatment of fractures and some other injuries of the head.

INJURIES TO THE SPINAL CORD.

BY HALDOR SNEVE, M. D., OF ST. PAUL, MINN.
Chief Surgeon Chicago Great Western Ry.

To fully cover the subject assigned to me would be too much of a task, and I purpose simply to review briefly that class of injuries which give rise to the greatest diversities of medical expert opinion, which has led to the baptism of one form of trouble with the term "railway spine," and which has called down on our heads the greatest reproach for our testimony in courts of law. Progress is being made slowly but surely, and hitherto dark areas are becoming clear through careful and painstaking investigation so that it clarifies the situation for us as railway surgeons to take stock frequently and, through mutual discussion, keep ourselves abreast of advancing knowledge. For convenience of consideration we can divide injuries of the cord under some arbitrary headings:

COMPRESSION AND CRUSHING INJURIES.

These are always associated with severe fractures or displacements of the vertebræ. Paralysis, both sensory and motor, is immediate and complete. When the paralysis below level of lesion is partial, there is some hope that blood extravasation and not bone displacement is the cause of the paralysis.

Where a complete transverse lesion of the cord exists, there will be complete flaccid paralysis and anesthesia, permanent loss of all

reflexes, trophic disorders, and paralysis of bladder and rectum. If the lesion is partial, in a week or less the reflexes appear and are exaggerated, accompanied by ankle clonus and peripheral spasm of the muscles. The prognosis in all these cases is exceedingly grave and, in general, may be said to depend on the height of the lesion, growing graver as we ascend. The level of the anesthesia is the safest guide to the cord segment involved.

The rule for operation that I have formulated for myself is: *Operate early in every case of crushing injury where there is reason to believe that the lesion is not a complete transverse destruction of the cord.*

It is unnecessary to cite illustrative cases as there is little or no difference of opinion about this class of injuries.

Dislocations of the vertebræ are practically limited to the cervical spine and are nearly always caused by hyperflexion. I have elsewhere (St. Paul Medical Journal, June, 1900), reported the case of a young man stealing a ride on the Great Western Railway, whose head was suddenly flexed forward on his breast from the telescoping of the freight car he was in. Paralysis was complete and immediate of the entire body below the neck. The patient called to his partner to pull on his head; this was done and replacement occurred with a decided snap. The numbness and paralysis immediately began to clear up and when I saw him some 16 hours later he had some use of his limbs, though they were weak, but the flexors and extensors of the hands were paralyzed; his bladder was paralyzed and all reflexes highly exaggerated, with ankle clonus present; there was burning and tingling over vertebræ involved and in the fingers; slight touch on left

foot would produce clonic spasms of that limb, and the slightest pressure over an area from 5th to 7th cervical spines also produce clonic spasms of both legs. In little more than one month he had fully recovered, except for some weakness of right hand and fingers.

There was no chance for litigation and I have no doubt that this shortened the period of disability. The tingling and paresis in the fingers, the tenderness over the point of injury and the production of spasms by slight pressure, point to meningeal irritation and root symptoms probably from hemorrhage.

HEMATORACHIS AND HEMATOMYELIA

or bleeding into the spinal canal, extra- or intra-dural, and into the substance of the cord, deserve a brief consideration because the recognition of the symptoms of these accidents will aid us in differential diagnosis when we are confronted with that large group called concussion of the cord. Hemorrhage into the spinal canal is usually extradural; the symptoms are usually quite definite: there is severe pain in the spine, peripheral tingling and burning, muscular spasms, even convulsions, and when the hemorrhage is large, pressure on the cord produces an incomplete paraplegia. Hemorrhage is usually recovered from without an operation. Hematomyelia or bleeding into the cord is for all practical purposes limited to the cervical spine and especially to the 4th, 5th and 6th cervical segments, and is from the anterior median artery. The cause is nearly always overflexion of spine. The damage arises from compression or laceration of the cord tissue and this again is practically limited to the gray matter. The hemorrhage may be punctuate or a central hematoma may form from 1 to 2 inches in extent and the onset of symptoms is sudden.

In small hemorrhages we will get partial palsy of one or both arms, causing wasting of certain muscle groups. In the large hemorrhages we get sudden paraplegia, due to interruption of cord condition, and sensory symptoms, pain, anesthesia, especially thermanesthesia, at times the picture of syringomyelia, and when one side of the cord is affected, a Brown-Sequard paralysis. The bowels and bladder may suffer and the reflexes comport themselves as in incomplete transverse lesions of the cord. The prognosis is not as good as in meningeal hemorrhage and some disability is permanent. The treatment consists in rest with the patient on the belly, counter-irritation, and derivation through the bowels.

CONCUSSION.

Under this heading comes that large class of debatable cases where a patient after a trifling or moderate shaking up, becomes ill or hypochondriacal, apparently suffering from a nervous affliction which, in the majority of cases, is referred to the spinal cord.

Let us first consider the question: Is it possible to concuss the spinal cord in the sense of concussing the brain, or demagnetizing steel with a blow? Erichsen assumed the existence of concussion as the basis for his "Lectures on Railway and Other Injuries," begun in 1867, but I submit that a careful study of the 53 cases he presented, in the light of modern knowledge, will make it more than doubtful if many of them should be considered as cases of possible concussion of the spinal cord. He mixed up hematorachis, hematomyelia, actual lacerations and so on under this heading. Practically all we know of concusion we think we have gathered from so-called concussion of the brain; in this field we are constantly narrow-

ing down the cases of so-called concussion and I think I state it fairly when I say that we understand by a concussion of the brain a state of sudden inhibition of function produced by violence without known structural change; when such occurs we should speak of contusion. In my opinion, we would be much nearer the truth should we discard entirely *concussion* and speak only of contusion, because concussion assumes some sort of molecular disturbance whose existence is purely theoretical. Anatomists deny that the spinal cord, protected as it is and held suspended in fluid by the denticulate ligaments, is susceptible of concussion or contusion. It has been assumed that sudden great variations of the cerebro-spinal fluid may occur, causing damage to the cord. This is also impossible, in my opinion, if we consider that communication of the spinal fluid with the ventricles is through the minute foramen of Magendie and that so small an amount of fluid exists in the subdural space around the cerebrum. Sargent, of Harvard, I believe, has made a careful study of the after-effects of football injuries in a large series of cases as regards the condition ascribed to concussion of the cord, and finds *none*. If concussion should occur anywhere, it ought to appear on the football field. Wagner and Stolper, after 20 years of study and observation, deny the possibility of concussion. Golding Bird says that if there is a concussion of the spinal cord, there must be paralysis of sudden onset, rapidly passing off, unattended by any gross lesion. On the other side of this question, there have been, and are cases of paraplegia after injury where postmortem has been unable to discover any lesion; lastly we have the experimental investigations of Schmaus. The last author, by repeated

blows on a plate over the spines of young rabbits, repeated many times on one day, or succeeding days, was able to produce paralysis; histologically he thought he detected a lymphatic apoplexy, or lymphorrhage, and a few foci of softening with signs of laceration of cord tissue, but still he hardly goes further than to say that in a human being a concussion probably acts only indirectly by diminishing vitality in the cord. If there is lymphorrhage or laceration it is manifestly improper to speak of concussion.

Oppenheim and others would call that class of cases, in which there is no gross lesion discoverable, *traumatic neuroses* and try to find a combination of hysterical and neurasthenic symptoms which warrant the name. Charcot and his pupils spoke of traumatic hysteria (from auto-suggestion) and traumatic neurasthenia. Most neurologists of the present day deny any special nervous affection from trauma or shock. My own observation of a large number of cases has convinced me that the nervous states following injuries are not spinal troubles at all, but *psychic affection* brought on by fright, or else cases of transference of a traumatic neurosis from the brain of some doctor to that of the patient through suggestion, or else *malingering Litigation Neuroses* would characterize the majority of these cases better than any other term. Bevan has stated my views of the matter in rather a brutal way. He says:

"(1) Real injuries of the nervous system present positive and immediate symptoms.

"(2) Those alleged injuries of the nervous system without positive and immediate symptoms or gross lesions are either malingering or abnormal cerebral states, traumatic neuroses, or a mixture of the two.

"(3) Traumatic neuroses are the result of suggestion.

"(4) No secondary degenerations of the nervous system follow traumatic neuroses. Pathologic conditions present in old cases are due to degeneration from disuse, and general deterioration from confinement, lack of exercise and dejection.

"(5) The subject of traumatic neuroses will not receive its proper place until the medical profession recognize their responsibilities in the development and continuance of these conditions and until proper measures are provided for the punishment of malingerers and their alleged medical experts."

Chronic subacute myelitis is a favorite expression of many alleged experts, where the real condition, if anything, is either malingering or a so-called neurosis. Our knowledge of myelitic processes in the cord, aside from gross lesions considered under captions given above, points overwhelmingly to an infective or toxic origin and I do not believe is ever produced by mild jars or *concussions*.

Case of H. B., a brakeman on the C. G. W., who was thrown down in engine tender bruising his back; was in a hospital in Chicago for about ten days and then was discharged, cured. He went to his home town and got into the hands of one of the legal parasites who prey on corporations. Some doctors were called in and, after about a month, he was sent up to me for examination. He had on a rubber urinal and dragged his legs as though there was but little power in them to walk. He alleged that he had no sensations in either leg, from the hips down; that they were partially paralyzed and that he did not have control of his bladder. The strange thing about the rubber urinal was that

it did not have the characteristic ammoniacal odor which always belongs to this sort of receptacle. When asked about it, he claimed that he had just cleaned it and that accounted for its lack of smell. Every one who has had experience with these, knows that it is impossible to get rid of the odor. He claimed to have no tactile sensation in his legs and jabbing him with a pin did not elicit any response, but the application of the faradic brush promptly caused a howl which he claimed was due to pain caused in the bones by this application. He was emaciated to an astonishing degree. The reflexes at the knees, ankle and cremaster were normal. I advised the Company that he was a malingerer and the case went on for trial. His physicians did not testify that he was suffering from a spinal cord disease, but they lent their influence and moral support by appearing for him and testifying that he was a very sick man. An alleged neurologist from Chicago testified that this man was suffering from subacute chronic myelitis and that he would never recover. The physicians on the other side testified that he was a malingerer. He received a verdict of $15,000, but the Supreme Court ordered a new trial. The case was settled by the Company for a few thousand dollars and the young man promptly went away. A short time since he was braking for the Union Pacific Railroad.

It appears, to produce his extreme emaciation, the young man had consumed an immense quantity of vinegar. Here was a case simulating cord disease and it seems strange that a nervous specialist should have been deceived in this case.

Another case, somewhat like this one, was that of a young Hebrew, 21 years of age, who

was shoved off from the end of a street car in St. Paul, alighting on his buttocks. He developed a paralysis of the right leg, from Poupart's ligament down, of motion and sensation. This case was seen by two of our best neurologists, who diagnosed his condition *traumatic hysteria*. The young man had a couple of attacks, supposedly hysterical in nature. I examined him, with his physician, and we found the skin, muscles, and other structures of the limb to be apparently perfectly normal. He used a crutch and dragged his right foot after him in a straight line, so that the toe of the shoe was worn off perfectly square. At first sight it seemed as though the diagnosis was correct, but placing the young man on his back, the wire brush and faradic current elicited howls of pain, after stabbing him with a pin had failed to evoke any response. He claimed to be unable to move a toe or to lift his limbs, but upon raising and bending up his knees, while he was in a recumbent posture, and making believe that we were making some comparative measurements, he was made to maintain his legs suspended in the air. Since it is impossible to do this if there is complete paralysis, it was apparent that the young man was a malingerer. The other expert maintained, in spite of this demonstration, that this was a case of traumatic hysteria. It is true that hysterical anesthesia will frequently shift itself, but in my opinion, the hysterical subject would be just as unable to feel the wire brush as he would the pin pricks. The young man received $1,000 shortly after this, and a few days after the receipt of the money, I met him walking along the street.

Hysteria is a serious diagnosis before a jury, and physicians should be extremely careful in

separating malingering from hysteria and neurasthenia.

The systemic diseases, such as locomotor-ataxia, spastic paraplegia, multiple sclerosis, paralysis agitans never result from these light jars or falls and if they develop they were already present at the time of injury. Straus recently showed a case to the Berlin Medical Society where locomotor ataxia apparently developed after a trauma, but he states that dilatation of one pupil was present many months before the injury. I have watched the evolution of a similar case without any traumatic factor where a dilatation of the pupil existed for two years without any other symptom, with subsequent development of the upper cord form of tabes. If any form of chronic cord disease should be produced by trauma, we would expect it to be multiple sclerosis, yet notoriously trauma is a practically unknown factor in its etiology.

McC., a brakeman on the C. G. W. Ry., fell from a box car and simulated multiple sclerosis and aphonia. He apparently suffered from incessant coarse tremor and jerking of the limbs, increased upon voluntary effort and inability to speak above a whisper. A laryngologist found hysterical paralysis of one vocal cord, and two nerve specialists found that he was suffering from traumatic hysteria. A settlement of several thousand dollars was made and two weeks later McC. was pitching hay on a farm he had bought in South Dakota. Here was another malingerer who imposed upon the specialists.

A neurasthenic state frequently follows a slight injury but its connection with trauma is more than doubtful (Wagner and Stolper).

Mental influence is the factor here as it is in *hysteria following trauma.*

What is the ordinary history of so-called traumatic neurasthenia? A person is slightly bruised in a wreck and, after the full contemplation of the danger he has escaped, becomes badly frightened. The company physician who first sees him assures him that he will be all right, that he is just bruised up a little. Then the anxious members of his family, fearing that he may be seriously injured, call in a physician who carefully examines the patient with his grave professional air and, if he is honest, he cheers the patient up by telling him that he will be all right after a little but that he had better keep quiet in bed for a few days. Here is the fatal suggestion which starts the long chain of this patient's troubles. It is the duty of the physician, after an examination has satisfied him that the patient is not suffering from anything more than some bruises and fright, to tell him that he does not need the services of a doctor and for him to get around and pay no attention to this episode and, above all, not to talk about it.

The physician, unfortunately, is desirous of making as many visits as he can, reasoning that if the patient is not seriously injured he will be all right any how after a time, and perhaps prescribes some sedative or analgesic. The patient upon receiving medicine and being put to bed begins to fear that perhaps after all he has sustained some more serious injury than he knows. After a number of daily visits from his physician, he begins to worry about who will pay his doctor bill. Then a lawyer is called in who assures him that there will be no trouble in making the corporation pay for his suffering, his time, his doctors and his medicines.

Now begins that long fire of questions about his sensations, which result in the discovery of a number of morbid manifestations. Another physician or two and probably a specialist is now called in, and the merry war goes on. The result of all these questions concerning his condition, and all of these examinations, is to fix in the mind of the patient fear of serious illness. A pain in the back, a tired feeling, a loss of ambition, dizziness, general weakness and some increase in the pulse and heightened reflexes are now discovered. Forced inactivity and introspection, together with a few doses of bromids or morphin have disordered his stomach, coated his tongue and caused some emaciation. Now we have a fully developed case of "neurasthenia traumatica." The desire for indemnity and the fear of trial simply adds fuel to the flames. We should now call this condition a litigation neurosis. The evil started with the first suggestion to the patient that he was sick, because he was ordered rest in bed and medicine. This picture is so common and the corporation doctor meets it in its many phases so frequently that it induces in him that condition which some physicians denominate *corporation prejudice.*

The labors of the neurologists, mainly Gowers in England, and some others, mainly in Boston and Philadelphia in the United States, in showing that sometimes serious cord troubles apparently may follow insignificant injuries laying undue and disproportionate stress thereon, have done incalculable harm and injustice, because physicians say: "Let us give the patient the benefit of the doubt, he may have some serious trouble."

When we consider that the railway surgeons of the United States have seen 1,000 cases suf-

fering only from litigation neurosis, to every one suffering with organic trouble seen by these neurologists who have taken this anti-corporation attitude in the matter, is it any wonder that they have a prejudice? We must remember that we are dealing with the most human of desires, namely, to get rich quick. What we need most now is more ability to differentiate malingering from actual disease, and courage to define before a jury litigation neurosis.

DISCUSSION ON THE PAPERS OF DRS. MAYO, PRITCHARD, COLE, WRIGHT, OWENS AND SNEVE.

DR. JAMES H. DUNN, of Minneapolis, Minn.: I do not know that I can add very much after all that has been said on this subject of head injuries. However, since you have called upon me to open the discussion, I will say a few words.

With reference to the paper read by Dr. Mayo, I have no adverse criticism, but agree in the main with everything he has said. I would like to bring out one or two points that he did not refer to. In the first place, several have spoken of more thoroughly shaving and cleaning the scalp in cases of scalp wounds. We find the scalp is not sufficiently shaved, and in our examination sometimes the shaving of the scalp thoroughly leads to important results, particularly when it is properly done. A case was spoken of in which it was discovered that a nail had penetrated the scalp, but it was not until a long time afterward. I recall a similar case. The patient was carted around and several x-ray examinations were made, whereas two minutes' proper use of the razor would have shown that the ball had penetrated and had passed out of the skull at another point, although the two or three physicians who had seen the case did not suspect it had. Proper shaving is absolutely necessary in all penetrating wounds of the skull. The scalp should be shaved extensively, and proper clipping of

the hair in some cases will greatly facilitate the examination.

One of the essayists referred to a point I can not help but notice. He stated that certain cases of fracture of the skull required no treatment. Of course, he meant no surgical treatment. This is an error prevalent among the profession that many cases of fracture of the skull require no surgical treatment. It is strange how this doctrine leads to neglect and proper care of cases. Every serious head injury should be treated. This does not mean the skull should be trephined or opened, or the patient given drugs, but he should be given careful treatment. These cases should be properly examined and carefully watched.

There are three things in these cases of traumatic head injuries which have puzzled me. First, the diagnosis of them. Second, the technic when we come to operate on them. Third, the prevention of scar tissue following the operations referred to by Dr. Mayo. (I believe he referred to this as following injuries, but it may follow operations.)

Certain things are well settled. I imagine under the first head, namely, the diagnosis, when we have a compound fracture or penetrating wound of the skull, we know what to do. When we have a marked depression of the skull, or a fracture with depression of the skull, we are generally agreed as to what to do. We should operate when we have an injury of the head with definite focal symptoms, whether there be a fracture of the skull or what-not. It is perfectly clear in such cases what must be done. We should clear the condition up by opening the skull. We can not be too radical in regard to this proposition.

But that has not troubled me; my trouble

has been this: We meet with a class of cases in which there are mixed symptoms. We leave out of the question whether the head is fractured at the base, or whether there is a fissure somewhere or not. It is entirely immaterial whether there be hemorrhage and depression. The matter of fracture or injury to the bones of the skull is secondary. A man may have an injury and die in which there is no injury of the skull apparently; but there may be a rupture of the middle meningeal without any fracture. That must be left out of the question. But these patients are in a more or less unconscious condition, and there are no distinct or well-defined indications as to what the lesion in the brain is. It is probably mixed, and there is no definite indication of just where we shall go after the lesion. What shall we do in such cases? Some are apt to be radical; they are apt to say, "When you are in doubt, operate."

I rather think the reader of the last paper was a little more radical in his ideas of operation in fractures at the base than I would be. But when are we to operate on these cases? I can not remember very many cases of fracture at the base. Injury in them is apt to be a contusion, with laceration of the brain, or a moderate amount of hemorrhage on the surface of the brain, or it may be within the brain tissue or within the ventricles, or there may be a fracture at the base or a fissure. There is a mixed condition. These patients go along for a number of weeks, and I can recall cases which surgeons said were going to die, still the patients have recovered. But that is not the chief point. It is what good can we do if we open the skull, and where shall we enter it? Those are the cases that bother us.

In these mixed and difficult cases, what are the symptoms which will induce us to open the skull? And when shall we let them alone? It seems to me the principal question is, when not to operate in this class of cases. For my own part, I am not very radical about operating on them unless I have definite symptoms to guide me. I recall many patients who have been unconscious for three or four, or even five weeks, and who have recovered as well without operative intervention as they would have done with it. Some of you will say that it is not a dangerous thing to open a man's head, to trephine it. It does not amount to much. But what is the use of opening a man's head unless the indications warrant you in so doing? Even after exploring the skull you may not find out anything. It is essential to determine whether or not there is something to relieve, and very many times it is a serious matter to operate without having a definite object in view. Of course, it is not a serious operation to remove a button of bone and examine the skull; but if you open the membranes of the brain and the brain pops through them, and you wonder whether or not you have found anything, the removal of which will relieve the patient, it is objectionable. I should like to have heard more talk on the difficult class of cases, as to what are the indications for operating on them. I have not seen many cases of fracture or fissure at the base, unless the middle meningeal artery was injured, or we had an extra or subdural hemorrhage, and these cases are generally clear if we can get the proper history of the case and a proper investigation. We may have a patient who has been unconscious for hours or days; a little later the reaction of irri-

tability sets in, and that patient may die if you try to pass a catheter on him.

I recall the case of a man who was struck on the top of the head with a coupling pin. He had a contusion or laceration of the brain, probably, with more or less hemorrhage. I did not open the skull, as I did not know what good I could accomplish by so doing. The man has been working as a switchman for two or three years since the injury. I can recall other cases. Physicians who were present and saw this case at the time said to me, "Why do you not open the man's head?" I replied that I did not think I could do any good by so doing. If I had opened the membranes, I would have produced a scar, and with scar tissue the patient would be more likely to have epilepsy than he is in this way. Unless we can do some good, it does seem to me that we do a little harm in operating on these cases. True, I am not able exactly to say where I would draw the line in operating on them. The only thing to do is to carefully study each individual case. The probabilities are that we do some good by opening the skull in some cases when we are in the dark. Many cases have cleared up without operation, others have died. I have made post-mortem examinations on these cases several times, and the question has arisen in my mind, What could I have done if I had opened the skull?

In the case of a man who had fallen down stairs and was found in the back yard unconscious, nothing being known of the history, I trephined his skull as soon as I saw him, which was ten days after the fall, as he was still comatose, and removed a blood clot from the base of the brain. His condition cleared up some. In some of these cases you can re-

lieve tension, and it may be important from a medico-legal standpoint. He died in a short time. I don't know whether he died on account of sepsis getting in through the opening I made or not; but doubtless infection crept in and along through some of the fissures at the base of the brain. I do not think we can accomplish very much by shutting off infection by drainage of the skull. That hardly seems probable to me unless there is a focus we directly tap, as in an abscess, or something of that sort, or we remove fragments or infection at the point of operation. By shutting off infection, which occurs from fracture at the base of the skull, which creeps in through a fissure, communicating with the parts there, hardly appeals to me.

I wish to say a few words in reference to the matter brought up by Dr. Mayo, but which he did not go into particularly, namely, osteoplastic flaps. Where it is desirable to have a large opening in the skull, by all means this method of turning down an osteoplastic flap is a good one. I don't think, however, we ought to ride a hobby too far; but where we are likely to need for exploration or operative work a hole in the skull, the better way is to make this osteoplastic flap. In the first place, we will have room; second, we can make it quicker. The question might arise, How to make it? I have investigated this matter. I have made these flaps with chisel; I have tried various means, and finally have come to the conclusion that in a hospital, where one does most of his surgical work, or all of it in one place, the best means is by electric saws and burrs. It may be done perhaps more skilfully; but if I had my surgical work to do sometimes here, and then there, or out of a hospital, or

am called to a distant city, I would rather go back to the use of the chisel. I have no hesitation in saying that, with one exception, the chisel discounts them all. The objection to the use of the chisel is that it produces concussion of the head. If a man uses the chisel in such a way as to communicate or produce the least concussion to cause damage, he has every advantage with the chisel. I have tried the Gigli saw and all other means; I have spent considerable money on them, but I am satisfied the chisel is the best. It is always at hand; it is simple, and with the one single exception mentioned, it discounts all other means for the average man who has to operate in different places.

Dr. D. S. Fairchild, of Des Moines, Iowa: I have not given this matter any special consideration, and, therefore, I am hardly in a position to open the discussion and say anything that ought to be said of such valuable and admirable contributions as these papers have been.

In regard to the treatment of injuries to the spinal column, fracture or dislocation, it seems to me, that where we have complete paralysis of the body, showing the cord itself is extensively damaged by the injury, it is hardly worth while to subject a patient to operation. If, however, the patient is allowed to wait for a time, and there appear signs of return of sensation or motion, showing that the cord itself is not entirely destroyed, then operation should be done. I am opposed to operations upon the spinal column or upon the vertebræ, when it is clear the spinal cord is crushed, and these cases should be allowed to wait until it has been shown that the cord is not entirely destroyed, and if, after a little time, it is

shown there is some conduction of sensation and motion, it is quite proper then to make a laminectomy for the purpose of relieving the trouble. It is true, in some cases through delay bed sores will form, and when they have formed the skin becomes infected, consequently there is more or less danger in opening in this region. In a case which I have under observation at the present time, the man sustained a fracture of the spine. There are evident manifestations of sensation and motion. There are also bed sores over the seat of fracture, and it would be very unwise, in my judgment, to make any operation at the present time until these bed sores have healed because of the danger of infecting the parts that do not bear infection very well.

In regard to Dr. Sneve's paper, which is an extremely valuable one, he has considered carefully certain questions with relation to diseases of the spinal cord. Now, we are told by some of our neurologic friends that actual injuries to the cord are rather common; and they also tell us that malingering is rather uncommon; that we rarely meet with people who malinger. I do not agree with our friends on that score. I have a great deal of respect for the nerologists; but I have suspicion, too. In fact, I know some who are engaged almost exclusively in giving testimony upon certain subjects connected with nerve injury, and I have heard one of them say that he has had as many as 100 cases, and had found points of sclerosis scattered throughout the cord without there being any symptoms of it during life. That was new to me! But this, emanating from a neurologist, I presume it is true. (Laughter.) They have a great deal of theoretical matter mixed up with their ideas, and they assume

if a person has a certain class of symptoms these symptoms constitute a group, and this group shows that the spinal cord is involved. On one occasion a neurologist gave as his opinion that an individual was completely paralyzed; that he had an organic lesion of the cord, with inability to walk. It was shown afterward this man was in the habit of getting up in the hospital at night, climbing down the fire escape and engaging in various kinds of sports conducted at midnight. The case came up for trial. Our friend was unable to testify against the railroad company. He found the patient had been doing these things, and was incompetent to give testimony. He could not stand the cross-examination.

Such neurologists as Knapp and Mills hold views which we as practical surgeons know can not be true. They find a group of symptoms, and they hold these indicate disease of the spinal cord. They adhere to this view, and insist they are right, but we know when many of these cases are finally disposed of the patients get well promptly in a large number of cases. I asked a neurologist once, who was discussing this question, whether or not he had met an exceptional class of cases. We as railway surgeons meet with cases which are settled or disposed of in some way or other. We know they get well. This neurologist said he only saw a few cases that got well, and he assumed because he saw such a percentage of cases that did not recover this was the general experience and general average of cases, while we as practical men find a large number of these cases are simply simulated, exaggerated, simply worked up by lawyers and physicians, and the symptoms at once disappear

when settlements are made. We stand opposed to the neurologists on this one point. We know that malingering is a common thing, and that disease of the spinal cord which manifests itself a long time after an injury is sustained is the exception.

Dr. Harvey Reed, of Rock Springs, Wyo.: There is one matter which I will speak of in reference to the remarks made by Dr. Fairchild as to injuries of the back. It has been my misfortune to have had some 13 laminectomies, with two recoveries only, and I wish to say in connection with Dr. Fairchild's remarks, that when we have a real injury to the spine there is no malingering, but we do have it when there is nothing the matter with it.

I was particularly interested in the paper of Dr. Wright, on fractures of the base of the skull affecting the base of the brain. Of all injuries of the skull we have to deal with, they are the most perplexing in my experience. I have never yet had the courage to make an operation for them, and it is about the only thing I have not operated on. I have realized the fact that in getting at the base of the brain we have a great many nerve connections, and I have always felt afraid—to be honest with you—to make any attempt at relief in fractures at the base of the skull; yet I believe with Dr. Wright we have a right to do it under our present antiseptic and aseptic methods.

In reference to injuries of the skull, speaking now of the vault of the cranium more particularly, I have made it a point, where I had any reason to believe that there was a depression or an injury from traumatism on the skull, to make an operation. I was present at the time Dr. Roberts delivered his address at Washington, if I remember correctly, which

Dr. Mayo referred to in his paper this morning, when the members of the American Surgical Association sailed into him for the statement that there was no more danger in trephining than there was in cutting off the little finger. I believe Dr. Roberts was right, although it seemed radical at that time, and I think it can be corroborated and established from the fact that the operation has been made since in injuries of the brain that have come under the care of various surgeons. The results show that there can be an immense amount of damage done to the brain without causing death, and not only that, but the patients recover.

I recall the case of a man who was injured in a tie camp, 175 miles from Rock Springs. He was carried in a wagon some 40 miles, put on a railroad car and sent to Rock Springs. He did not reach there until three days after he was injured. He sustained a crushing injury of the skull. I removed half a teacupful of brain substance, and he got well without paralysis or any mental disturbance, and soon returned to camp. This case shows what an immense amount of injury can be done to the brain and yet the patient recover.

The question was raised in one of the papers relative to operations on the brain being followed by epilepsy. That is one of the most serious difficulties we have to contend with. I contend it is an easy matter to remove fragments of the skull, and I agree with Dr. Mayo that in a fresh injury the skull should be replace, if you have any of it to replace. But where it can not be replaced and we have to make an operation to relieve the condition of the patient, you will find in one or two or three years, as the case may be, epilepsy will develop

sooner or later, as the result of cicatricial tissue contraction. My experience has been this is difficult to overcome, and it is a serious matter, because the party at the time is in a condition which needs immediate attention. You give him that attention, but the results give trouble and worry.

Dr. S. C. Plummer, of Chicago: I would like to say a few words in reference to the paper read by Dr. Sneve. One of the functions of this Academy is to fix the standard for examination, and another one is to eliminate "railway spine" and concussion of the spine from the list of eligible diagnoses; that is, concussion of the spine as meant by Erichsen, as it includes altogether too much. As Dr. Sneev has said, it may include a hemorrhage into the cord or membranes of the cord. Erichsen makes it include more than that, a meningitis, a transverse myelitis, or even laceration ot the cord, the membranes, or the spinal column itself. We can not make any prognosis when a diagnosis is made that includes all that. We must separate the matter into definite items of disease. If there is such a thing as concussion of the spine, it is a transitory inhibtion of the functions of the spine. The patient recovers from all symptoms in a short time. If the symptoms persist, they are due to something else than that. I wish we could eliminate traumatic neurasthenia. We can not do it, however. We see patients who were healthy before they suffered trauma, get into a neurasthenic condition. Some of them are honest; they are not all malingerers. But I think we do not want to make the mistake of attributing these cases to spinal injury, because they are not due to it. As Dr. Sneve claimed, they are chiefly mental; they may be

due to a concussion of the whole nervous system, including the cord, the brain, and also possibly the sympathetic nervous system, whose functions we do not know so well. The important point is the prognosis in these cases of traumatic neurasthenia. Is it as favorable as it is from any other form of neurasthenia? It does not differ from any other form of neurasthenia except in its etiology.

One of the speakers mentioned an opinion being given by the examining surgeon for the railway company. He said these opinions should be fair. That is a good point. We want the railroad authorities to know just how bad the case is. It does not pay to try and belittle the injuries of a patient and lead those on the legal side of the case to think that it is a trivial matter when it is a serious one.

Dr. John H. Miller, of Pana, Ill.: One point occurred to me in regard to spinal injuries and paraplegia while Dr. Owens was reading his paper. I have had three cases of paraplegia which were due to a tight prepuce. By circumcising these patients they got well. I have relieved a number of very nervous children by circumcision, and I think it would be well for us to watch these patients and examine them for a tight prepuce. Remondino, in his work on "Circumcision," says cases of paralysis due to a tight prepuce are quite numerous. A person might get a shaking up, and it might be attributed to an injury of the spine, whereas the trouble may be found to be due to a tight prepuce. We know that circumcision prevents the formation of certain diseases. I make it a rule in cases of tight or redundant prepuce to perform circumcision as a precautionary measure against syphilis or gonorrhea. If this rule is followed in many cases, the companies

will be relieved of suits brought against them, on account of railway spine.

Another question that came up in one of the papers was with reference to waiting, and not trephining too soon. I saw the case of a boy some time ago, who, in playing with others, had a little dispute, and was struck on the head. He lay unconscious for twenty-four hours. I saw him rather casually, as they had sent for another physician. While I was examining him the physician came who was sent for. I said to him I thought the boy would be all right; that I did not think his skull was fractured, but he insisted, after an examination, it was. I was informed that this man had trephined three cases lately, and that he proposed to remove a button of bone at the base of the skull in this case. The next day, happening to be in the neighborhood, a little girl came out laughing, saying that something funny had happened just now. I asked her what it was, and she said that two doctors had come to bore a hole in her brother's head, but he ran away, and had no further trouble. I neglected to say that the three cases he trephined died.

Dr. R. Harvey Reed: A remedy for epilepsy is to implant a piece of bone, ox-bone, whatever it may be, over the opening in the skull, and it can be done very readily by using decalcified bone. I have found that a valuable remedy in preventing epilepsy.

Dr. Sneve: Dr. Fairchild was rather severe on the specialty which I follow in my private practice, and in railway surgery. I think he was a little too hard on the neurologists. I don't think there is any fight between railway surgeons and neurologists. Very many of the latter take practically the same views as railway surgeons on the subject of spinal concus-

sion and the nervous states following trauma. I wish to say there must be some reason why railway surgeons have such a firm conviction. Most of the nervous states following jars are not serious, are not associated with organic injury of the spinal cord, and the reason is not far to seek. I venture to say, that if the material was collated in the U. S. of 100,000 cases, 95 per cent of them would be found to have recovered mostly by the aid of greenback plasters.

Dr. Wright (closing): One word in defense of the remarks made by Dr. Dunn. The same argument he advances of injuries at the base of the skull would apply to intra-abdominal injuries. If a man receives an injury of the abdomen, Dr. Dunn would not hesitate to open the abdomen and investigate, provided the clinical picture was serious. I think the same plan of treatment will apply in fractures at the base. Where we are certain that the nose, the mouth, or the ear has been opened up and the visceral contents exposed to the dangers of septic microorganisms gaining access to these avenues, I believe we should operate to try and lessen the mortality.

SEVERE INJURIES OF THE LARGE JOINTS.

BY J. M. CROSBY, M. D., OF STUART, IOWA.

When a joint is twisted violently or wrenched, being followed by severe pain and swelling, it is said to be sprained. These injuries are exceelingly painful and troublesome in their consequences. We have all found the old saying to be only too true, that a severe sprain is much more serious than a simple fracture. The intensity of the sprain is very remarkable when we reflect on the low degree of sensibility possessed by normal ligaments. They may be cut across without pain, but if stretched in a longitudinal direction or twisted so as to separate the articular surfaces, pain of the most intense character is at once set up; a wise provision of Nature against articular displacement.

Sprains most frequently occur in the wrist, knee and ankle joints; I speak more particularly of the latter two. We who are in general practice, at least, pay too little attention to this class of injuries. Too often when called to see an injured limb, we examine it carefully for fracture, and, finding none, tell the patients it is only a sprain, direct them not to use the limb for two or more weeks, prescribe a liniment and dispel the case from our mind, when really we should keep watch of them as closely as a fracture case. Telling a patient not to use a joint counts for but little, as a rule, unless the surgeon makes it impossible,

the patient finding he can still use the joint, although with some pain, continues to do so. This is one reason why sprains are so tedious in their cure and so frequently leave stiffness or weakness behind. In mapping out a treatment for these severe sprains we should exercise our very best judgment and be cautious in estimating the amount of damage done to the soft parts that hold the joint surfaces together and the degree of swelling that will likely follow. It is on this point of misjudging or failing to diagnose the exact damage done to ligaments and other soft parts that so many of us fail in our treatment. We treat it for one kind of injury when really we have another. It may also account for the wide difference of opinion as regards treatment among many of our best writers. H. Sneve, quoted in the "Practical Medical Series,"* says: (1) Ligaments are rarely or never torn in so-called sprains, and are never stretched. (2) The pathology in the majority of sprains is a rupture of the areolar and connective tissue around the joint and a contusion of the lining. (3) Immobilization of muscles is not rest. On the contrary, all sprains should have passive exercise the first few hours and days, and active exercise after that. In the majority of cases active exercise should be instituted from the beginning. (4) Plaster casts should not be used at all, even in cases where we have a fracture, unless it be impossible to maintain a proper position of the joint. (5) Hydrotherapy in shape of ice applied over a wet cloth the first few hours; water in the shape of hot fomentations where we wish a stimulation is of very great value. (6) The counter irritation of static electricity in conjunction with massage is the very best treatment for a sprain. (7) The

ambulatory treatment of sprains in conjunction with massage is today the best treatment."

Senn says in his book on "Practical Surgery," under pathology of recent dislocations: "One of the constant pathologic conditions is more or less tearing of the ligamentous connection. A dislocation can never occur in a healthy joint short of some laceration of the soft structures that hold the articular surface in contact." He further says: "After reduction has been effected, premature, active and passive motion interferes with the ideal healing of the joint wound and should be carefully avoided until the healing process is completed. In the case of large joints, complete rest from three to four weeks in a plaster cast. Active and passive motion, massage and electricity at the expiration of three or four weeks after the injury are the most useful therapeutic resources in removing stiffness, in preventing ankylosis, and in restoring the normal range of motion and usefulness of the joint."

Now, we all know there are joint injuries known as "subluxations," even when we examine the case the joint surfaces are in their normal position, but at the time of the accident they were very near dislocation, the ligaments on one side of the joint being torn as in a dislocation. How decidedly wrong it would be in this case to strap them up with adhesive plaster and tell them to walk, and walk the usual amount every day. I have never had any personal experience with the Cotterell dressing for sprains of the large joints, which is so highly recommended by Gibney in Dennis' "System of Surgery." In short, the details are as follows: Say for the ankle joint, employ massage for five or ten minutes with the foot well elevated; next, apply strips of adhesive

plaster about one inch in width by twelve to eighteen long. Apply in a criss-cross manner, so as to thoroughly support all tender and swollen parts, using four or five of these strips in all. Over this a cheesecloth bandage is applied, then the patient's usual stocking and shoe. Start him to walking for half an hour and insist upon him attending to his usual work, walking as much as usual each day. At the end of the week it is well to remove the strips and reapply as before.

This, likely, is a very good dressing for a mild or medium sprain, but would not appear to me to be just the thing for a severe one, especially if any ligaments have been torn. It is also very difficult but very important to judge about the amount of swelling we will get. A case in point: A man of forty-three, weighing 200 pounds, was wrestling with a man about his own weight, and in some manner severely sprained his right ankle. He called his local physician, who saw the limb soon after and decided to put it in a plaster cast at once, which he did. During that evening the limb became more and more painful; he sent for the doctor, but he was out of town. The pain became unbearable from the increasing swelling and tightness of the bandage, so the patient, assisted by his father, with knives and saws removed the cast and the pain also. We can readily see why this patient was so thoroughly disgusted with the plaster cast treatment. He would not allow the doctor to apply a second cast, so he used crutches for three months, then a cane for two more, and when I saw him, six months after this injury, he was limping around without any cane, ankle still swollen and tender and probably always will be. A better method on the start would

have been to put his foot and leg into an old style "fracture box" for a week or ten days where ice could have been applied to the joint. When the swelling was subsiding, apply a plaster cast and leave it two weeks, remove it and put on another closer fitting one, being sure to keep the joint immobilized long enough to allow the ligaments to heal. We have all seen old sprains with adhesions within the joint and in the neighboring synovial sheaths, consequent upon the inflammation following. In this condition the swelling has completely subsided, but the movement is limited, and any attempt to forcibly exceed the limits is accompanied with intense pain, usually localized at one spot. This form is best treated by forcible movement or wrenching under an anesthetic.

Case II.—On April 1, 1899, I was called eleven miles in the country. The messenger who came said a boy had cut his leg badly on an ax, but did not know the exact location of the wound. So I took my ordinary emergency bag, reached the patient at 9:30 p. m. and found a slight boy of thirteen, who had been carrying his father's overcoat and a sharp ax through some brush and fell on the ax, with his knee flexed. The patella was cut squarely in two in the middle, the blade entering the joint so as to not cut either tibia or femur. It was ten miles to send for assistance, dark, roads very bad, and raining, so I proceeded alone. Sterilized some water, my instruments and sutures; also made sterile several of the dishes and pans. Then I gave an anesthetic and had his father continue it while I irrigated the joint very thoroughly with 1-1000 bi-chlorid, sutured the cut surfaces with four heavy silk sutures, catching well into the ligamentous structures. Then closed the external wound tightly, applied a

small antiseptic pad and supported the ligaments with strips of adhesive plaster. A long, straight splint was then applied to back of leg and thigh; at the end of one week removed all outside sutures, and, finding no infection, put the limb in a plaster cast. I left this on two weeks, removed it and put on another, which I left for two weeks more, then cut it down in such a way that could reapply it, used passive motion of knee, slipped the cast back on and removed every two or three days, using the passive motion, continuing this two weeks; at the end of four months the boy was not lame at all and has perfect and full use of the joint.

Case III.—The first of last June was called in consultation for a severely injured ankle. A man of forty-five was thrown from a buggy while his team was at full speed, producing a compound dislocation of the ankle and fracture of both tibia and fibula into the joint. The tibia had fractured only a small piece off its outer side, and the balance had been forced through the skin at the inner side of the joint, protruding one and a half inches, and, of course, covered with dust. The patient was at a farm house, eight miles from town. After sterilizing our dressings, sutures, etc., we very thoroughly irrigated the wound with a hot solution of 1-1000 bichlorid, replaced the bones and sutured one-half of the external wound, leaving a good sized gauze drain in. In this case we used an anterior and posterior plaster splint with good satisfaction, made as follows: Take four to eight layers of crinoline, cut to fit the surface of the limb, with a layer of "lintene" (a form of compressed cotton) for the protection of the skin. After the plaster has been rubbed into the meshes of the crino-

line, the different layers are fastened together with ordinary pins, which are converted into staples by a stapling tool. (1) The plaster should be rubbed well into each layer of crinoline separately by hand. (2) In handling the splint, care should be taken lest the plaster be shaken out. (3) In soaking the splint, seize the open ends, immerse gently in warm water, keeping hold of the splint to prevent the plaster from being washed out of the meshes. (4) Apply one splint to the limb with a roller bandage, apply the other splint to the other side of the limb with another muslin roller. (5) In reapplying the splints the same plan should be followed of applying each splint with a separate roller so that they may fit as before and not pinch the limb in front or behind. We had no suppuration in this case, repair has progressed favorably, he moves the ankle joint some and is beginning to bear weight on the foot.

I mention these two cases to impress the necessity of the strictest antiseptic precautions from start to finish, and that the function in many of these severally injured and infected joints *can* be saved even in rural districts.

DISCUSSION.

Dr. A. B. Brumbaugh, of Huntingdon, Pa.: I was called into the country about six miles to see a young man, who had been cutting weeds with an old scythe, covered over with green scum. He accidentally severed the patellar tendon and cut through the bones of the head of the tibia and back along the side of the joint about two inches, so I could turn it up and open the whole knee joint. I had nothing but hot water, but washed it out, cleansing it nicely, and closed it up with the material in my pocket case. The wound healed without

discharging a drop and the young man is not lame.

I can not quite see why it should be supposed a severe sprain can occur, with no laceration of ligamentous structures, when in these same sprains there is an effusion of blood and serum that causes great swelling at times. In my opinion every severe sprain is accompanied by laceration of the ligaments, as well as of the soft structures in the vicinity.

Dr. H. C. Fairbrother, of E. St. Louis, Ill.: Slight sprains, severe sprains, severe wrenches, are accidents of common occurrence. The extent of internal rupture is only a matter of degree in these cases. A severe wrench of the ankle, for instance, may not only be a sprain, but it may be twisted around one way or the other. The important point in these cases is to determine whether rest should be maintained or the opposite. It is rather important for a body of this kind to have some rule with regard to rest or non-rest. My decided preference would be in many cases for rest. For instance, if I had a sprained ankle, rest can be secured either by an adhesive plaster dressing or by a plaster-of-paris dressing. The former was published by some surgeon here in Chicago a year or two ago, with a cut illustrating it. If the ankle is bent over, if there is inversion, the foot may be everted or placed in parallel lines and plaster applied to hold it there. If the foot is drawn outward, it may be held in its natural position by adhesive plaster. But my rule has been always (and I have seen it applied often) to use the fixed treatment, and the unfixed treatment, so that I have no hesitancy whatever in expressing myself as being strongly in favor of fixed treatment in sprains of the ankle, and my plan is

to apply the plaster cast, or, rather, a plaster stirrup splint. In this way we can spring it open or shut up the bandage, tightening and loosening it for the convenience of the patient, the swelling, etc., and removing it as soon as practicable. That is my view of the treatment of sprains of all degrees from slight to severe wrenches. Rest is the best treatment, and the best way of securing rest for a badly wrenched ankle is the application of the plaster stirrup, made something like that which has been spoken of.

Dr. R. Harvey Reed, of Rock Springs, Wyo.: With reference to sprains, the most acute diagnostician can not always tell whether he has torn ligaments or not, or just exactly which ones, or how they are torn, or exactly where they are torn. He can not tell whether the capsule is ruptured and dragged back into the joint cavity, or not. All these things are important factors in the treatment of sprains. It is oftentimes better to have an open joint where you can go in and clean out all foreign material, and treat it as an open wound. This I have done frequently, and have found very advantageous in open tears of the joints.

I have a case now in which a man was working about an engine, the engine started, and caught the ulna and tore it upward, but did not fracture it. It did not fracture the radius, but tore the joint out, and tore the muscles about the arm nearly half way to the elbow joint without causing a fracture. I opened the joint, it was not infected, and the chances are from appearances that the man will have a fair recovery from an injury of that kind.

As to the treatment of the joint, I do not use antiseptics in the joint which will stop the synovial secretion if I can avoid it. I

favor the use of a very mild antiseptic, and after the parts are once cleansed I use a bichlorid solution, which is composed of alcohol, listerine and bichlorid in certain proportions, which is less irritating to the parts, and get the benefit of the antiseptic bichlorid. After that I use mild antiseptics to prevent germs entering the joint, and at the same time retain the synovial membrane as much as possible.

As to the question of treatment, I most emphatically endorse what Dr. Fairbrother said in reference to fixed treatment of the joint. We never think of moving a bone around when we set it, for the reason that if we move it back and forth we will get a false joint. What do we want when we have an injured joint? We want repair of the joint, and how can we get this repair if we keep jerking it around in the form of passive motion? I get better results in the treatment of these cases by using the fixed treatment than by passive motion.

With reference to the use of a splint, I have discarded plaster of paris and have not used it in the past five years. Young surgeons frequently come to me and ask what kind of splints to use in the case of John Smith or Jones, and I say to them: "Use your own splint. If you are not a sufficient mechanic to meet the emergency, you are not a fit surgeon for a mine or a railroad. Then mold the splint to the limb, and not the limb to the splint."

I have discarded plaster because (1) it is heavy and clumsy; (2) it is liable to cause pressure when you don't want it; (3) it is dirty to put on, and (4) hard to get off. I prefer silicate of soda. It is light, strong, elastic, easily put on, easily taken off, and in our

country it is by all odds the best. We live in a dry country, where it dries quickly. After the joint has been thoroughly cleansed and it is time to put on a splint I put on the silicate of soda splint, cut out a window so as to have free access to the joint, keep the joint washed out clean, and allow healing to take place by granulation the same as we would in any other wound that is thoroughly disinfected. My experience is that we get fairly good results in open wounds, and certainly after sprains, unless you have a part of the membrane inside the joint, and then you are sure to get ankylosis. Why? Because that portion of the membrane, especially the capsule, is bound to grow attached to the bone on each side. It presses in to such an extent that it produces a certain amount of irritation, the result is you are going to have more or less ankylosis under the circumstances, but you may not be able to tell wehther there is membrane in there or not. It may be a piece of tendon. But if you really believe it is in there, advise opening of the joint, and cleaning it out, as it is safer, and gives a better result in the end.

Dr. Jere L. Crook, of Jackson, Tenn.: In reference to the method of treatment of sprains, since the gentlemen have come out so strongly in favor of the fixation treatment, if a man's experience has been satisfactory it is his duty to report it. In 1896 I read a paper on a "Modification of Gibney's Method," and I demonstrated it before a society on a patient. I have had reports from various professional friends who have used that treatment favorably. In sprains of the ankle I use the Gibney treatment, supporting the injured joint and allowing the patient to use it.

So far as pain is concerned, when the joint

is supported on the outside by adhesive straps, the patient does not suffer any pain, and he will go off "a walking advertisement," literally speaking, for you and your treatment. If you will try it, you will become convinced of the efficacy of this treatment in sprains of the ankle. I don't recommend it for sprains of the knee.

Dr. L. Sexton, of New Orleans, La.: One word with reference to plaster-of-paris. We live in a climate where we can not treat large joint injuries with silicate of soda, owing to perspiration and dampness of the climate; it is not thick enough. With the climatic conditions of a dry country, I can realize how it will do. Not to be too severe on my old friend, plaster-of-paris, I will mention a case in which I was able to use it.

An engineer on the lower division of the Illinois Central came to me and said that he had to jump to save his life; he ran into a pile of cross ties. The knee joint was dislocated backwards, and his femur was fractured above the condyles, the leg being at right angles. We immobilized the fracture. We could not have gotten any silicate of soda to have held the fragments in place. The injury was severe, and plaster was very convenient in this case. Dr. Owens saw the case later while the man was on a visit to Chicago. As I have said, we immobilized the joint to get union of the fractured ends. We got a stiff joint for a long time. The patient was insured in an accident company, and this fact might have made the joint a little stiff longer. (Laughter.) Notwithstanding the fact that massage was resorted to regularly to restore lost motion, the patient had only a limited use of that joint.

Let me relate one other case which will show the advance in surgery. I remember on one

occasion we had a man with loose cartilage in the joint. The patient could walk, but every now and then would fall. This was in the preantiseptic days. Dr. T. J. Richardson, who was a celebrated surgeon of that time, saw the case, and I urged him to operate for the purpose of removing the cartilage, as the man was constantly slipping and falling down. It was finally removed, but the question of operation was debated for some two months, off and on. This case came to my mind after hearing the splendid result which the doctor got in his case in the country, with no trained nurse, etc.

With reference to bichlorid, on my own hands it will produce a rash in 1:1,000, so that it is too strong to put into a joint, which is not already infected, because, as a matter of course, where there is a fresh cut, there may be some infected material, but we do not know. I congratulate the doctor on the result in the case, but if his patient had any bichlorid propensities, it would have brought them out.

But to return to the point of advancement in surgery. As celebrated a surgeon as Dr. Richardson was, he did not want to tackle the knee joint in the case I have referred to with a view to removing the cartilage. It shows the great advantage of antiseptic surgery over the preantiseptic system in surgery. I have a clinic at the Charity Hospital, New Orleans, and our standard solution of bichlorid is 1-2000 or 1-3000. On clinic days I have excluded the use of bichlorid in such strong proportions as 1-600 or 1-500.

Dr. Quinn: I would like to ask, doctor, whether you have seen any bad results from bichlorid used in that strength?

Dr. Sexton: Yes; I have seen them quite often; they are not uncommon. A bichlorid

rash, as we call it, or, as others call it, "bichlorid eczema," is not uncommon.

Dr. R. Harvey Reed, of Rock Springs, Wyo.: In reference to the strength of bichlorid, I have not used it stronger than 1-3,500 for a year or more. I think, however, that climate has something to do with the rash. I use it every day; my assistants use it. One of my assistants has never seen bichlorid rash. If you use it in the strength of 1-3,500, put up in glycerine and alcohol, I don't think it will cause a rash. It appears to me that 1-1,000 is too strong.

In reference to the question brought up by Dr. Crook concerning immobilization, he very truly says if you keep up the action of the bone, where it has been fractured, you get a false joint. But the point I want to make is this: Old surgeons told us to rub the ends together, get up friction, get up irritation, and thus bring about repair. In a joint where we have a delicate synovial membrane or poor ligaments on either side of the joint, if he have a sprain or a dislocation, it is necessary to keep the parts quiet to get good repair. Then, after you have gotten good repair, massage and passive motion come in to reduce the superamount of tissue thrown out by the process of repair. The best results are obtained by treatment of that kind. I do not deny that you may have a very mild subluxation or very mild sprain in which you may allow the patient to walk around.

Dr. Haldor Sneve, of St. Paul, Minn.: Since Dr. Crosby has referred to my paper, perhaps a few words from me will defend my position. In my paper I divided sprains into three arbitrary classes: (1) Where the patient turns the foot, followed by swelling and some disability; a plaster cast is applied at once, and the patient

is up and about in a month or less. The second, the more severe cases, where the patient in turning or spraining the foot falls to the ground. This class comprises the second degree of sprains. Sprains of the third degree are those where a patient falls from top of a box-car, or from some height, and severe injury is done to the joint. In many cases it is difficult to diagnose whether one has to treat a simple sprain or have to do with an intraarticular fracture. It would be ridiculous to tell a patient with this third degree of sprain to get up and walk around, because there is considerable effusion and laceration of the blood vessels, so that he can not walk. But in those of the first and second degrees, especially the first, the patient can always walk. In the second degree, he must lay up for a few hours, and you can apply massage and the Gibney plaster-cast, or a tight bandage or shoe which laces up, which will enable him to walk around.

In reference to the ligaments being torn, if we stop to think for a moment, they consist of white, fibrous tissue which is absolutely non-elastic. If this were not so, our muscular efforts in bending or fixing limbs would be wasted. This tissue is absolutely non-elastic. According to the investigations of a French surgeon, which were made some years ago, it takes a tremendous amount of force to fracture a ligament of any particular size. In short, it has to be broken like a bone. A ligament is rarely, if ever, fractured, but the bony attachment itself is more liable to be broken because of the amount of force required to tear these ligaments. I did not claim in my paper that ligaments were never torn, but I said rarely, if ever.

What is the condition we are confronted with when we have a sprain? We have a sudden dis-

location of the joint surface, followed by immediate reposition, the small vessels are torn if the sprain is severe. It may be a severe injury of the third class, then there is a large hematoma formed. These patients must lay up for a certain period of time. In the mild cases there is very little injury to the soft tissues. What is the use of rendering the joint immobile for repair of the areolar tissue? It is absolutely unnecessary.

In the second class, where there has been a fall, where there has been a greater degree of injury, besides tearing of the blood vessels and this effusion or hematoma, there is perhaps also some contusion of the membrane lining the joint, and of the membrane covering the bony surface; but these injuries do not require much immobilization.

As to the use of heat and cold, what do we want to use cold for? We want to diminish the amount of effusion. Therefore, when we are called to a case of sprain, the first thing to do is to apply cold to eliminate that; heat to enable nature to remove the products of inflamamtory insult; to remove the leucocytes and effusion, massage is the thing to assist nature in doing this. This may be gently applied so as not to hurt the patient. Our orthopedic surgeons have a large class of unfortunate patients who are being treated for the after-results of sprains. They are cases put up in plaster casts or immobilized; the tissues become sensitive; there is an apparent lengthening of the ligament, just like the idea that ligaments are easily torn, with which we are all imbued. We have the idea that ligaments can be stretched. All of your books on anatomy will tell you that it is an impossibility. What does occur after all this areolar tissue around

the joint is absorbed? There is loss of preternatural mobility of the joint, and there is apparent lengthening there. I can refer to what I said in my paper, that immobilization of muscles is not rest. Time is too short to go into details; but let me say, that when these muscles are put up in plaster they undergo atrophy. It takes a long time for the muscles to regain their volume and strength.

Dr. R. Harvey Reed: I want to make a slight correction, so as not to be misunderstood. I referred to torn ligaments, and we do occasionally have them. I want to corroborate what was stated by the gentleman from St. Paul (Dr. Sneve), that it is usually a tearing off of the bone to which the ligament is attached. The treatment of the wound is the same. I have seen the crucial ligament torn; but the muscle is sufficiently elastic. The ligament is not elastic, as any one knows who studies anatomy, but the muscle to which it is attached is elastic; hence that prevents its tearing when it would otherwise tear, if subject to some sprain.

Dr. A. H. Brumbaugh: I have seen torn ligaments; I have seen ligaments torn loose from the bone, and in either case it destroys the support of that side of the joint, and it amounts exactly to the same thing.

Dr. Crosby (closing): The main point in my paper was to make a correct diagnosis at the start. I can not always do it myself. The essential point is to know whether we have had the ligament torn loose, as the treatment of the case would be the same. I think the gentleman from St. Paul (Dr. Sneve) is correct, that many times the ligament has taken a piece of bone with it, but it is commonly spoken of as being a tear of the ligament.

Another point in my paper I tried to emphasize was this, that we should be careful, when we are called to see these cases, not to treat them as sprains of mild or moderate degree when they are really ones of greater degree. We should strive to see the cases early and decide promptly what course to pursue in treating them.

With reference to bichlorid I have used it in the class of cases dealt with in my paper in that strength (1-1,000), and have never had any serious results from it. In regard to applying the solution under a bandage in that strength and leaving on a wet compress, it would not be the thing to do. But in cases in which irrigation is used, bichlorid can be used in that strength.

FRACTURE OF HUMERUS FOLLOWED BY PARALYSIS OF ARM.

BY F. A. BUTLER, A. M., M. D., OF HOWARD, NEB.

Fracture of the humerus is classed as being quite frequent; also, according to the location and relation to the part of the bone injured, into fractures of the shoulder, fractures of the arm proper, and fractures at the elbow. Notable differences characterize injuries in these three regions, as to mode of production, course, consequences and their treatment.

In this paper the attention of the fellows is called to a case from practice of fracture through the surgical neck, and so much regarding this case of fractures, as the results that followed in this practice case. Fracture at the surgical neck is by far the most frequent break in the region of the shoulder, and is with reference to other fractures of the bone a common accident. Out of 203 fractures of the humerus reported by Hamilton, 44 were at or near the surgical neck. These figures accord with the observations of others, serve both to show the frequency of breaks through the surgical neck, and the comparative rarity of recognizable fractures through the part of the bone above the epiphyseal line.

Case.—Early one cold morning in December, 1901, I was called to see a man of 55 who had met with a serious accident the day previous. While walking on the ground driving a team, in crossing a ravine the team started suddenly,

turned and ran over him with a loaded wagon. He was some little distance from the house, which he finally reached an hour or so after the accident, in a semi-dazed condition. It was said he had suffered all night, slept but little, and examination revealed the right arm badly swollen, including shoulder and hand; considerable ecclymosis at shoulder. It was necessary to anesthetize the patient on account of pain, swelling, and general nervousness. Manipulation, combining traction with rotation, elicited crepitus, and the diagnosis was made of fracture through the surgical neck. This was reduced by traction and manipulation. Arm was then brought down to the side of the chest, hand and wrist supported in a sling, patient requested to rest in bed a few days, and an evaporating lotion applied to the shoulder. A splint composed of splint-board material with plenty of wadding was loosely applied three days later. After about ten days patient was permitted to get about the house and grounds and somewhat assist in superintending the ordinary business of his home.

Being a man of affairs and quite intelligent, it was one of those few cases which it was not only a pleasure to attend, but also to visit when the time between trains would admit. During the progress of the case thus far there had remained a badly swollen condition of the forearm and hand, with a coldness and "numb feeling" (in the patient's own words); forearm and hand cold and dead. Great care was directed to the perplexing condition, and with all the care and treatment it existed just the same. After a few weeks, with massage and motion, the shoulder became apparently normal, but the forearm and hand did not improve, so far as the swelling and numbness

was concerned. Prognosis in fracture of the shoulder nearly always being good, patient had been led to believe by his friends and another doctor (who gave voluntary advice) that in a few weeks, if his case was treated properly, he would be all right, which, of course, was not the case. Instead a paralysis of the forearm and hand ensued, and persisted for about eighteen months before they became possessed of their natural functions. At the time the injury to the bone was sustained the nerve trunks were injured, possibly the musculo-spiral, owing to its close relation to the bone. Compression by exuberant callus is more apt to supervene, where there is a fracture of the shaft of the bone, than at the head.

The perplexity of the case was not materially lessened by searching the various works on surgery at my command, as they contained but little that was encouraging. In a good many years' practice of general surgery, and having to deal with a few cases of slight paralysis following a fracture, I was perhaps fortunate not to have met with so discouraging a case to attend. By persistent care, massage, electricity and constitutional treatment, followed up in detail by an intelligent patient, the paralysis of forearm and hand was overcome, and the arm restored to its natural usefulness, after being paralyzed for about one and one-half years.

In *The Journal of the American Medical Association** an operation is described for liberating the radial nerve after fracture of the humerus for paralysis, by Launois and Lejars. In this case the nerve was enclosed in a sheath of new bone, entailing paralysis, hard edema and painful contraction of hand. An opera-

*Sept. 15, 1903

tion was performed four months after the fracture was sustained, to free the nerve. Function was gradually restored, cure being complete by the end of eight months.

Blench recently published statistics of 68 similar operations to liberate the radial nerve after healing of the fracture; in 41 cases, complete cure; six, nearly so; eight, marked improvement; three, slight improvement; in seven, results negative; in three, outcome not known. Thus cures or improvement followed in 85.5 per cent of the cases operated on.

DISCUSSION.

Dr. H. C. Fairbrother, of E. St. Louis, Ill.:

This is an interesting paper to me, and so far as I can judge, the treatment had nothing to do with the unfortunate complication.

Speaking about the application of bandages, the only case I have seen similar to the one mentioned was due to pressure. There are some cases of sloughing of the forearm as a complication of fracture of the humerus, and I can recall two or three where we could not exclude the treatment as a factor in the complication. This not being a railroad injury, we can eliminate the idea of malingering in the paralysis. Fractures of the humerus are noted for complications. I would place fractures of the elbow joint first for complications, fractures of the femur second, and fractures of the humerus third. Occasionally one meets with non-union and deformity in a case of fractured humerus, and occasionally paralysis and gangrene, but I have never met with a case in which I thought these complications were due to the impingement of the fragments upon the nerve or larger vessels of their own accord. But I understand that to be the case in this instance.

In treating complications following these fractures, as railroad surgeons, we have three obligations to discharge—the first one to the man, the second to the profession, and the third to the company we represent. I do not know which is the greatest of the three. Complications sometimes arise in injuries like this which are of more importance to the company, and they heighten our obligation to the company rather than to the individual. In ankylosis sometimes following fractures about the elbow we may have a better result, a stronger and more useful arm with ankylosis than with partial motion and greater weakness; but the former, while it is better for the individual, is worse for the railroad company. A case of fracture with ankylosis as a complication has a higher money damage value than a more greatly damaged arm with less appearance of damage. These three bones—the humerus, femur and elbow joint—are all subject to these complications and to bad results. This paper presents very clearly the subject of fractures of the humerus and their treatment, and in the case reported a very unusual result. I heard a surgeon say some years ago that, as a rule, in fracture of the humerus it would be just as well to cut down upon and wire the fragments in the beginning, rather than wait for union. That has not been my experience at all. I have treated a fair number of cases of fractured humerus, and I believe I have never had one in which there was lack of union.

Dr. R. Harvey Reed, of Rock Springs, Wyo.: Paralysis following fractures, whether of the humerus or any other bone, is a complication we may always expect. It is not always possible for us to determine the line of injury, that is, the line of force that has produced the

injury. Persons are hurt under excitement, and if you ask them a question as to the direction of force they are unable to tell you. In some cases where there has been little or no external violence we may have paralysis, and when you dissect down upon the bone you find the internal tissues are torn all to pieces. There is very little evidence of this externally. How many of you have taken off a limb as the result of a crushing injury from cars, or from some other force, in which the skin apparently is good, and in your attempt to amputate three or four inches lower down you find out the condition of the soft tissues underneath? Frequently in such cases you have to go up several inches more. I have had two or three cases of fracture within the last year or so below the knee up to the middle third of the thigh. Apparently there are no complications, but you should not be surprised to find that you have a nerve involved. You need not be surprised if you have paralysis, and you should not be surprised if you have destruction of the tissues as the result of paralysis, to say nothing about loss of motion or sensation. These are questions that should not reflect on the physician's ability. I care not how these cases are treated, we are liable to have them. We may have as the result of cicatricial contraction or of torn muscles which surround the nerve a certain amount of paralysis, that can not be controlled or overcome until after absorption has taken place, as in the doctor's case, a year and a half later.

Dr. D. S. Fairchild, of Des Moines, Iowa: The essayist described paralysis following fracture of the humerus. Dr. Reed has called attention to injury of the deep tissues, and a sloughing without any apparent serious injury

to the external parts. I have had a number of cases of paralysis of the musculo-spiral nerve without any sloughing, without any fracture, simply from the fact that the nerve was so violently compressed against the bone that paralysis followed. In one recent case paralysis continued for a number of months, and in this instance the reaction of degeneration had become marked in the muscles. The paralysis finally entirely cleared up, there was no fracture, no sloughing, simply the fact that the soft tissues and the nerve were violently compressed against the bone, the paralysis following from the condition of the nerve, as the result of injury.

Dr. O. B. Quinn, of McComb, Miss.: The statements just made are in accord with a case I recently had of a fireman. It was a question as to whether the temporary paralysis was due to the effects of the injury or not. The man's leg was caught between a water-spout and an engine tank, and he sustained a fracture of the lower third of the fibula. He also sustained a considerable contusion extending almost over the whole lower third of the leg. The case recovered apparently very nicely, as far as the fracture and contusion were concerned. This particular man sustained paralysis of the toes, so that he could not extend them. He could very feebly extend his foot by the use of the ankle joint. It is about four months ago since the accident occurred; he is gradually recovering.

The point I want to make is this: The damage that this man sustained, which caused the paralysis, was above the seat of fracture. The fracture of the lower third of the fibula could not have produced the paralysis, but it was undoubtedly the contusion he sustained

higher up, in the region of the extensor muscles of the toes. As I have said, he is recovering nicely under massage and other exercises.

Dr. Evan O'Neill Kane, of Kane, Pa.: I would like to mention in this connection the injurious effect upon nerves and blood vessels in connection with these fractures, and which often result from the well-meaning efforts of ignorant people at the time of the injury, who follow out in an imperfect way the instructions of "first aid." I have in mind two cases in which the application of an improvised tourniquet did very grave injury to both the nerves and blood vessels. In one case the arm had been amputated on account of the patient having injured the brachial artery. In the other case there was musculo-spiral paralysis on account of the retention of a handkerchief tourniquet some four hours. This was so tightly applied that at first the arm below was apparently completely dead, but after earnest efforts were made to restore circulation we got a condition sufficiently satisfactory to enable us to feel justified in saving the arm from permanent paralysis.

Dr. D. S. Fairchild, of Des Moines, Iowa: I desire to mention a case in this connection that came unler my observation, for the purpose of relieving anyone of the responsibility of having produced this paralysis by an unduly tight bandage. This case I had was one of musculo-spiral paralysis, in which no bandage was applied, but it was simply the result of injury, and therefore we should be very careful in ascribing these cases of paralysis to too tight bandaging.

Dr. L. Sexton, of New Orleans, La.: There is one suggestion that occurred to me in connection with this paper. Is it not possible the ensheathing callus had something to do with

causing paralysis? The reason this suggests itself is that after a year the paralysis began to subside. Of course, massage was applied, and may have had something to do in causing the disappearance of the paralysis, but the ensheathing callus is usually absorbed within a year or a year and a half. This nerve might have been injured by a sharp transverse fracture and the paralysis produced in that way, or it might have been due to the traumatism alluded to.

Dr. Butler (closing): I do not know that I wish to discuss my paper any further. The paralysis in the case was the point I wished to bring out, and if the patient had not been an intelligent and honest man, I should have had more trouble than I did. He was a large, plethoric man, and subject to nervous troubles in general, hence I gave a guarded prognosis in the beginning. It was fortunate that he was an intelligent man and looked up these things himself. In the case that I reported in the *Journal of the American Medical Association,* it was a good while before normal function and use of the arm were brought about. I was very particular in this case, as I had some two or three cases of slight paralysis before, after fracture of the arm, also of the femur, in applying loose dressing. If I had applied a constricted dressing in this case, not only the man, but others interested, might possibly have said that the paralysis was due to too tight or constricted dressings from the start.

While I have had some little experience with the different kinds of splints, the best results I have had in cases of fractures of arms and legs have been where I made the splints myself, using splint-board material or anything I could get at hand.

THE INFLUENCE OF TRAUMA IN THE PRODUCTION OF MOVABLE KIDNEY.

BY M. L. HARRIS, M. D., OF CHICAGO.

The influence of trauma in the production of movable kidney is a subject of special importance to the railway surgeon who is so frequently called on to decide whether or not a movable kidney in a given case is the result of a certain injury or accident. It is a common belief of the profession, as well as of the laity, that a movable kidney is frequently the result of an injury. Most writers on the subject assign to trauma an important place among the etiologic factors, but few of them indeed offer any evidence, such as the report in detail of cases, or of reasoning based on pathologic conditions found, in support of their statements. It is evident, therefore, that the statement has been passed on from one author to another without the subject receiving the careful attention which it deserves.

Before entering in detail into this phase of the question, it will be necessary to consider the etiology in general of movable kidney. It was early observed that the large majority of cases occurred in women, and as movable kidneys were first discovered in women with lax abdominal walls, the result of repeated childbirth, it was at once concluded that repeated pregnancies were the cause of movable kidneys. More extensive observations, however, gradually disclosed the fact that movable kid-

neys are much more common than at first supposed; that they frequently occur in the unmarried and in those who have never borne children, and, furthermore, that the right kidney is affected much more frequently than the left. Notwithstanding these facts, repeated pregnancies is still given as the most important cause of movable kidney by almost all authors. Of 126 women examined in order, it was found that those in whom the kidneys were not palpable or abnormally movable—fifty-five in number—the average number of children born per woman was slightly greater than in those in whom movable kidneys were found—some seventy-one in number. Of 107 cases of movable kidney in women, from the author's records, forty were single and sixty-five married, two not stated. Of the sixty-five married women twelve had never borne children; in other words, of 105 women with movable kidneys fifty-two had never been pregnant and fifty-three had borne one or more children.

These facts show conclusively that pregnancy in itself is not a material factor in the production of movable kidney. That retrodisplacements and prolapse of the uterus and vagina with lacerations of the perineum are material factors in the production of movable kidney, as stated by some, is likewise disproved by the above facts.

Another commonly stated cause of movable kidney is rapid absorption of the perirenal fat, but there are no facts in support of this statement. On the contrary, clinical experience, as well as observations at the operating table and in the dead-house, are opposed to it. Such a cause should be equally operative in both sexes, but we know how rare the affection is in man

as compared to women. The condition is not observed to follow acute wasting diseases, nor is it more common in emaciated subjects. While in some cases the amount of perirenal fat found at operation is small, in others it is abundant, and in the dead-house a small amount of perirenal fat is frequently found without a movable kidney. Movable kidneys are so frequently found in young women who have never been pregnant; whose pelvic organs are normal; whose abdominal walls are firm and, therefore, no diminution of intraabdominal tension present; who are not emaciated and who have never received any material injury; that all who have given the matter any serious thought and study have been compelled to seek other causes for the condition. The more the subject is studied the more it becomes evident that those in whom movable kidneys are found are defective in bodily form, that they deviate in some particular from the highest normal type.

Thus the investigations of Wolkow and Delitzin show deviations in the anatomic configuration of the posterior abdominal wall. The paravertebral niches in which the kidneys lie and which in the normal well-built individual are deep and show a distinct pear- or funnel-shape, are shallow and of cylindrical shape in those with movable kidneys, thus favoring displacement of these organs. Albarran[1] ranks movable kidneys with the bodily stigmata of degeneracy, and Stiller finds them associated with dilatation of the stomach and a loose tenth rib, which he likewise considers a sign of degeneracy. Becker and Lenhoff[2] found that the least abdominal circumference was much smaller in proportion to the body length in those with movable kidneys than in normal individuals, and the author in a paper[3] read be-

fore the American Surgical Association in 1901 demonstrated by a series of careful measurements of the body form that there was a distinst relative contraction or diminution in the capacity of the middle zone of the body in all individuals with movable kidneys. For the method and details of measurements I refer to my article above mentioned. Of 107 cases of movable kidney that I measured in this manner, all showed in a greater or lesser degree the characteristic contraction of the mid zone of the body. This diminution of the size of this body zone necessarily produces a downward displacement of the organs normally contained therein, and the right kidney, owing to the large non-compressible liver above it, is more affected than the left. It is this depression of the kidneys, particularly the right, together with the shallower paravertebral renal niches of Wolkow and Delitzin, that forms the chief predisposing factors in the production of movable kidney. The mere fact that the kidney is crowded lower than it should be does not in itself produce an abnormally movable organ. There are other factors at work. The lower plane of the mid zone corresponds to the lower border of the costal arch, and usually touches the anterior extremities of the tenth, eleventh and twelfth ribs. In all flexion movements of the body, whether lateral or antero-posterior, in all muscular efforts, such as lifting, straining, coughing, sneezing, etc., in which the lower ribs are adducted, this plane becomes the point of greatest constriction of the body. In individuals with what may be termed normal body forms, the major portion of the kidney lies above this line of constriction, and hence when this plane of the body is narrowed by any of the acts above mentioned, the tendency is not

to depress the kidney, but rather to compress it and hold it up, while, on the other hand, in those individuals with contracted mid zones in whom the kidneys are crowded lower than normal, the line of constriction lies above the major portion of the kidney, and, consequently, all acts producing narrowing of this plane tend to depress that organ. The constant repetition of these acts operating to depress the kidney, gradually leads to a stretching and elongation and loosening of the fasciæ and tissues tending to hold this organ in place, thus developing a movable kidney. If the above statements be correct, then it follows that every woman with the characteristic body form ought to have a movable kidney.

All the cases of movable kidney which I measured and examined showed a contraction of the mid zone of the body, and, while I am fully aware of the dangers of generalizing from a few cases, still, as the effects here referred to are the result of well-defined causes, the deduction appears justifiable that all women with contracted mid zones develop movable kidneys of greater or less degree. The causes of the contracted mid zone and the age at which the characteristic body form develops are questions of great practical interest, but a discussion of these here would lead us too far from the question at issue.

With these preliminary remarks on the etiology in general, we may proceed to a consideration of the influence of trauma in the production of movable kidney.

The question may be considered from two standpoints: the histopathologic and the clinical. During the past three years the author has made it a practice to open the peritoneal cavity in operating on movable kidneys. A

muscle-splitting incision is made in the antero-lateral junction of the abdominal wall, which affords not only free access to the perirenal space and kidney, but also permits a ready examination of the region intraperitoneally by simply incising the lateral fold of peritoneum. Through this incision one may examine on the right side of the anterior surface of the kidney through the peritoneum covering it; the range and direction of greatest mobility of the kidney; the ascending and transverse colon; the hepatic flexure; the cecum and appendix; the duodenum; the major portion of the liver with the gall bladder and bile tracts. An examination of this kind gives one a very much better idea of the changes which take place in the tissues which surround and hold in place the kidney than can possibly be obtained through the usual posterior incision. One always finds the perirenal fascia elongated. This fascia is distinct and separable from the peritoneum laterally, but becomes more intimately attached to or blended with the peritoneum ventrad of the kidney proper, from which it is separated by the perirenal fat, variable in amount. The fascia becomes more intimately attached to the kidney at the hilus, where it spreads out over the renal vessels, and on the right side passes dorsad of the duodenum, where it again becomes separated from the peritoneum, which passes ventrad of the duodenum. This fascia with the peritoneum, as already stated, is elongated and can easily be picked up in loose folds, in fact, it forms a veritable pouch, or sac-like covering, varying, of course, in size, in which the kidney moves. The perirenal fat and its attachment posteriorly is so loose as to offer practically no resistance to the mobility of the kidney. The hepatic flex-

ure and transverse colon adjoining descend, so that the pouch in which the kidney moves always lies above the colon. This is not the case on the left side, as here the pouch is usually formed beneath the splenic end of the transverse colon and internal to the descending colon. The attachments of the duodenum become lengthened, so that this portion of the intestine is often very freely movable. In a case operated on recently the descending portion of the duodenum could easily be drawn out into the lateral incision. The liver is often abnormally movable, and at times quite so. Usually its anterior border descends the most, but occasionally the posterior border descends and tilts the superior pole of the kidney forward. The renal vessels become elongated, attaining a length at times of 8 cm. (Hepburn), or even 13 cm. (Legueu). When the perirenal tissues become considerably loosened and the pouch formation well marked, the kidney is very freely movable, and might almost be classed as an intra-abdominal organ, yet the author has never seen anything that approached what might be called a genuine mesonephron.

An examination of the changes above mentioned makes it very evident that they are of slow development, as it is certainly impossible to elongate fasciæ and blood vessels and form distinct loose pouches suddenly. Based on these facts alone many excellent observers doubt the possibility of a sudden or acute origin of a movable kidney. Sulzer[4] says: "I believe that without the acceptance of a particular abnormal body condition a movable kidney can never be the immediate result of trauma." Keller[5] is also of the opinion that this condition can not be produced suddenly, but requires a considerable time for its development, and that, there-

fore, a kidney with a distinct range of motion discovered immediately or soon after the receipt of an injury must have been movable before, and its mobility can not thus have been caused by the injury. Büdinger[6] says, concerning the traumatic origin of movable kidney: "A sudden marked dislocation presupposes an extensive loosening of the kidney, and not only that, but a space below the kidney with a considerable change in the relations of the peritoneum." Sterns[7] says: "In the majority of the cases so far there occurred not a mobilization of a normally fixed kidney, but a dislocation of an already movable or incompletely fixed organ."

When we turn to the clinical aspect of the subject, we find the evidence presented requires the most careful analysis, as the possibilities of error are very great. Most of the opinions expressed are based on two classes of cases. In the first class a movable kidney is discovered on examination. The patient states that at some time more or less remote a fall or accident of some kind was experienced. The conclusion is immediately reached that the movable kidney is due to the accident. In the second class the same conclusion is reached based on the facts that a patient examined soon after an accident is found to have a movable kidney. The conclusion in neither of these cases is justified by the evidence. In the first case there is usually no relation shown between the nature of the injury and the supposed effect, and no continuity of the symptoms from the time of the injury to that of the discovery of the movable kidney. In the second case the discovery of a kidney with a distinct range of motion immediately or soon after an accident is positive evidence that it existed before, as it certainly

takes time to develop a movable kidney. In a third class of cases we find the history something as follows: A person whom the physician knows personally to have been in good health meets an accident involving, perhaps, the region of the kidney. On examination soon after the physician discovers a bruise or contusion of the side with tenderness, and a movable kidney. It would seem here that the injury was certainly the cause of the movable kidney, but the error in the conclusion is due to an error in the premises. Because a person was in good health previous to an accident is no evidence that a movable kidney was not present, as it is a common experience of the examining room to find movable kidneys, the presence of which was not only unknown or unsuspected, but which gave rise to no symptoms whatever.

Sulzer[4] says in regard to the relation of injury to movable kidney: "However, one must be very careful in judging of these relations, for on the one hand we know from other diseases how readily people in general refer their troubles to a particular injury, and on the other hand, we shall see later that on the occasion of a fall, exertion, etc., a movable kidney which is already present may suddenly present severe so-called strangulation symptoms, and thus become first known to the patient or physician after it has existed without symptoms for months or years." Güterbock[6] says: "The pain in a movable kidney which was discovered immediately after an accident is not the slightest proof of any connection between the accident and the movable kidney, nor are all other subjective symptoms any proof, so long as it can not be demonstrated with unequivocal certainty that the kidney was not movable before that time." Just why one individual with

movable kidney should have no symptoms whatever of the condition, while another with even a less marked case should suffer great annoyance and discomfort is not always easy to explain.

It is a common observation that a person with a movable kidney not giving rise to any discomfort will suddenly develop symptoms after a slight accident, such as a fall or an unusual muscular effort, after a nervous shock or mental depression. Sometimes the mere knowledge that the condition is present gives rise to symptoms. On the other hand, the author saw a woman who was suffering considerable pain and discomfort in the right side from a movable kidney, which she herself discovered, but supposed was a cancer. The symptoms all disappeared when assured it was not a cancer, but simply a movable kidney. She remained free from further annoyance for several years. Another person may complain of symptoms only when the nervous system or general health is below par.

It will thus be seen that one must be extremely careful in attributing the cause of movable kidney to an event, simply because it is coincident with the development of symptoms. One will search the literature in vain for a satisfactory case in which a movable kidney was found soon after an injury, and in which the absence of the condition had been previously demonstrated by examination.

At this point it is necessary to distinguish between a displaced kidney and a movable one. No one familiar with injuries will doubt for an instant the possibility of suddenly displacing a normal kidney by violence. Such cases, however, are very rare. They have usually followed severe crushing injuries affecting the

region of the kidney. The perirenal tissues are always more or less lacerated, the peritoneum frequently torn, and at times when the displacement has been great, the renal vessels themselves have been completely severed. The kidney may also be displaced more slowly by a hemorrhage into the perirenal fat. Subcutaneous injuries of the kidney and perirenal tissues are by no means uncommon. Riese[8] has just reported 491 cases from the literature. In many of these there was hemorrhage into the perirenal space with more or less displacement of the kidney. One might suppose that with absorption of the blood in these cases the kidney might remain movable. While such a result may be possible, it is by no means the rule. On the contrary, it is the rare exception, for with the absorption of the blood and organization of part of the blood clot, new connective tissue is formed, which may fix the kidney even more firmly than it was before, but its location may be slightly altered. Although Güterbock[9] is of the opinion that such perirenal hemorrhages may be the starting point of movable kidneys, he was unable to present any cases in support of his opinion. The case of Peyrot which he quotes was not a case of movable kidney, but of a kidney found somewhat displaced by blood clot at operation two months after a fall. Sterns,[7] in discussing this phase of the question, says that so far he has "never been able to find a single case of perirenal hemorrhage or traumatic peudohydronephrosis in which later a movable kidney was demonstrated." As bearing on this question I present the following case which I observed a short time ago:

Mrs. K., aged 40 years. In a car accident she received a severe direct injury to the left

side of the body, in which the left tenth rib was fractured. A large swelling, hematoma, developed about the left kidney, accompanied by hematuria. The swelling was very painful and she was confined to her bed for several weeks. The swelling was some months in disappearing, and a year after the accident the left kidney was still somewhat enlarged, tender and movable. She also had a very movable right kidney, which had existed for a long time.

Admitting, then, that a movable kidney may have its origin in a perirenal hemorrhage of sufficient size to partially displace that organ and loosen up its fatty and fibrous capsules, still it must be acknowledged, judging from the lack of recorded cases, that such an origin is extremely rare indeed.

The class of cases, however, which most frequently comes before the railroad surgeon is of another kind. Of course, many cases of severe and serious injuries are encountered in railroad surgery, but those in which movable kidney is alleged to have resulted are usually not of the severer kind. The most frequent accidents are falls while alighting from or attempting to board cars; jars and general concussion from collisions, or by reason of the cars jumping the track, etc. In the majority of cases the movable kidney has not been discovered for some weeks or months after the accident, when the case has been worked up by the personal injury lawyer and doctor. The influence of these latter factors on the patient is often very great, and might furnish the basis of a very interesting study.

But laying all such questions aside for the present, let us consider what influence, if any, trauma may have had in the production of movable kidney in these cases. I have analyzed

1,300 cases of railroad injuries that have come under my supervision during the past two years. Of this number 728 were male and 572 females. Although several of the males presented symptoms indicating injury to the kidney, there were no cases of movable kidney observed. Among the 572 females there were forty-one cases of movable kidney in which the question of a traumatic origin arose. The ages of these patients ranged from 16 to 62 years; twenty-eight were married and thirteen single. Both kidneys were movable in nine cases, the right alone in thirty-two. In no case was the left kidney alone found movable. In twenty cases measurements of the body form were made, and all without exception possessed the characteristic body form with contraction of the middle zone.

It should be remembered in considering the details of these cases that they were all suits for damages. The manner in which the injury was received was based on the patient's own statements, and at times was not borne out by the evidence. It is well known, too, that the patient's statements as to symptoms, previous state of health, etc., must be received and weighed with great care and judgment, for they often have not the same significance and value as the statement of a patient seeking relief of a physician under ordinary circumstances.

Of the forty-one cases nine were seen and examined within thirty days after the accident.

Case 1.—Miss B., aged 21, single. While she was standing up in a car, about to get off, the car bumped into a car ahead and she was thrown against an upright post, striking right side of the abdomen. She got on another car and rode several miles down town; she had a hysterical fit and was taken home. I examined her the

next day. She was a slender woman, of nervous temperament. Pulse 82. Temperature 98.2. No bruises were to be seen anywhere on the body. The right kidney was movable to one inch below the umbilicus. It was not tender nor painful on motion.

CASE 2.—Mrs. D., aged 31, married, was riding in a buggy which was struck by a passing car. She was thrown forward and got her foot caught in the spokes of the wheel, spraining her ankle. She was pregnant four months, but did not miscarry. She was examined six days after the accident. There were no objective evidences of injury except that to the ankle. Right kidney was movable to the second degree.

CASE 3.—Mrs. J. W., aged 22, married, in a collision was thrown forward and backward, then fell on the floor. She continued on her journey, remained away visiting all day and night, and returned home next day. She was not laid up at all, but claimed injury to her back, a sprain of the lumbar region, and bruises of her back, right elbow and both legs. Examination thirteen days after the accident showed no bruises about back or elbow. There were two small bruised spots on the legs. The right kidney was movable to the second degree, and not tender. There were no symptoms referable to the kidney. The contracted middle zone was shown by measurement.

CASE 4.—Mrs. F. A., aged 22, married. The car in which she was riding collided with a wagon, and she was thrown back in her seat. She was frightened because she saw someone fall off the car. She was seven weeks pregnant and miscarried five days later. Examination eighteen days after accident showed that she had recovered nicely from the miscarriage. The right kidney was movable to the second degree, but there was no tenderness or soreness about it. No bruises were found anywhere about the body.

CASE 5.—Mrs. S. S., aged 21, married, was thrown to the floor of a car by a collision. She fractured the right forearm and bruised her right side. Her physician stated that he

found a small amount of blood in her urine soon after the accident, but when examined seventeen days after the accident the urine was normal. The right kidney was movable to the second degree. It was somewhat tender, but was not enlarged, nor was there any enlargement or thickening about it.

CASE 6.—Mrs. N. D., aged 32, married, in a collision was thrown forward, then backward. She struck first on the front of the chest and epigastric region, then on the elbow, arm and back. The injury complained of was to her elbow, arm and shoulder, with tenderness in the epigastric region. Examination twenty-three days after accident showed the right kidney movable to the second degree, bruises of the arm at the shoulder and the elbow. There were no symptoms of injury to the kidney.

CASE 7.—Miss S., aged 27, was sitting in a car, the side of which was struck by another car; this jarred her back. She was menstruating at the time. Her physician said he discovered a movable kidney very soon after the accident, and that she had blood in the urine, which in all probability was simply the menstrual blood. Examination twenty-seven days after the accident showed the right kidney movable to the second degree. Measurement showed typical body form.

CASE 8.—Mrs. S., aged 26, married, was getting on a car just as it started. She did not fall but swung around. She claimed a wrench of her side and her hips, although she did not feel anything at the time. She was not laid up, and had no physician. She complained of backache and pain in her side. Examination twenty-seven days after accident showed a nervous, anemic woman, with characteristic body form and both kidneys movable to the second degree. The uterus was retroverted and the patient had leucorrhea.

CASE 9.—Mrs. K., aged 61, married, asserts that while walking on the street she was struck by a car, knocked down and rolled under the fender. She was able to get up alone, went home in a car and was in bed ten days. She asserted that her whole right side was bruised

from her neck down. Her physician said he found blood in her urine; that the right kidney was pushed out of its capsule; that she had two attacks of uremia from kinking of the ureter; and that he was obliged to massage the kidney back into place. When examined twenty-seven days after the accident she was up and visiting friends. No bruises of any kind were to be found. The right kidney was found movable, but the urine was clear.

These nine cases were examined so soon after the accident, and the kidneys were found so very movable and so free from unusual tenderness that it is very evident that in none of the cases was the accident the cause of the mobility. The injuries received were not severe in any of them, Case 5, with a broken forearm, being the worst, perhaps, in this respect. Case 9, which at first glance seems to show a casual relation between the injury and the movable kidney, must be rejected. The statements of the patient and her physician were not believed, for reasons which need not be mentioned. The case was afterward settled for a very nominal amount.

There were six cases which were examined within three months after the accident.

Case 10.—Mrs. M., aged 57, married, fell on her right side while getting off a car. She claimed womb trouble with frequent urination as a result. Examined two months after the accident, there was found a laceration of the perineum with prolapse of the uterus and vagina. She had had eight children. There was a very pendulous abdomen with general visceral ptosis and a movable right kidney. It was very evident that none of these conditions resulted from the fall, and the case is therefore rejected as showing casual relations.

Case 11.—Mrs. G., aged 25, married, fell on her left side and abdomen while getting off a car. She was two months pregnant and miscarried. She had had two children. Examina-

tion, a little over two months after the accident, showed a laceration of the perineum, a tender uterus, prolapsed ovaries, and the patient pale, weak and nervous. The right kidney was very movable to the third degree and somewhat tender. As she had been in bed most of the time since the fall on account of the miscarriage, and as there had been no symptoms referable to the kidney, it was very evident that such a high degree of mobility could not have been produced by the fall.

CASE 12.—Mrs. T., aged 36, married, was thrown from a car while turning a corner and struck on her left side, shoulder and hip. She was examined less than two months after accident. Five years ago she had been ill with peritonitis for six weeks, and had had pain and soreness in abdomen since. She was very nervous and hysterical. There was a small bruise over the sacrum. The right kidney was very movable. There were no symptoms referable to the kidney. The movable kidney was undoubtedly of long duration.

CASE 13.—Mrs. W., aged 31, married, did not fall, but in getting on a car she was swung around against the side of the car. Her injury was not severe in any sense. Examination two and a half months after accident showed a very characteristic body form and both kidneys movable to the second degree. There was a marked pulsation of the abdominal aorta. No possible connection could be found between the injury and the movable kidneys.

CASE 14.—Mrs. M., aged 40, a widow, owing to sudden stopping of a car was thrown forward, then backward, striking her right side against the seat. She was in bed four weeks. There were no symptoms of injury to the kidney. She complained of loss of hearing, headache and pain in the right side. Examination three months after the accident showed diminished hearing in both ears from chronic middle-ear trouble and the right kidney movable to the third degree. The high degree of mobility and the marked contraction of the middle zone show clearly that the kidney had undoubtedly been movable many years.

CASE 15.—Mrs. P., aged 29, married, fell to the floor as the car in which she was traveling started, injuring her right knee and her left side. She complained of the knee and of excessive flowing. Examination three months after the accident showed an injury to the right knee, a prolapsed left ovary and chronic endometritis. The right kidney was movable to the second degree. The nature of the injury and the lack of symptoms excludes the accident as the cause of the movable kidney.

There were five cases examined from four to six months after the accident. Of these cases, 16, 17 and 18 gave distinct histories of movable kidney before the accident, and can therefore be excluded. They are:

CASE 16.—Mrs. B., aged 34, married, was thrown out of a carriage and the carriage wheel passed over her right hip. She had chronic heart disease, lacerations of the cervix and the perineum, and double movable kidneys, right to the third degree, left to the first degree, all dating before the accident.

CASE 17.—Mrs. H., aged 40, a widow, fell while getting off a car, striking her left hip. the right kidney was found movable to the second degree. Characteristic body form present. She had felt a lump (kidney) in the right side from before the accident.

CASE 18.—Miss N., aged 26, fell in a sitting position in getting on a car. Her injury did not incapacitate her. Double movable kidneys, the right to the second degree, and the left to the first degree. The symptoms dated back long before the accident. Characteristic body form found.

CASE 19.—Mrs. B., aged 30, married, was alighting from a car when it started. She held on to the hand rail, then fell on her back. She was in bed six weeks and asserted that her uterus had been displaced, but the physician had corrected same. She was a thin, emaciated subject with pulmonary tuberculosis. The uterus was in good position. Right kidney movable first degree; there were no symptoms.

CASE 20.—Mrs. H., aged 50, married, was

thrown off a seat by the car starting and struck her left knee, side and shoulder. Both kidneys were distinctly movable and the left one tender. The nature of the injury was such that it could not possibly have produced double movable kidneys, although it may have added to the tenderness of the left one.

The remaining twenty-one cases were examined from six months to three years after the accident.

CASE 21.—Miss R., aged 22, was standing when the car started, causing her to fall against the stove, then against the knees of sitting passengers. She bruised her right knee, hip and shins. After riding several miles home, she was in bed one month. She was examined six months after the accident. She asserted that she had a great number of nervous symptoms. She was tall and slender and had the characteristic body form and a very movable right kidney. A retroverted uterus was found, also inflammation and thickening of right tube and ovary with considerable leucorrhea from infection. The injury was not severe, but the patient was a hysterical neurasthenic.

CASE 22.— Mrs. S., aged 28, fell from a car by reason of a collision with a wagon. She bruised her right hip and had hemorrhage from the womb and was in bed ten days. She was a nervous patient, with a long history of irregular menstruation, frequent urination, backache, etc. She showed the characteristic body form and had a tender right kidney, movable to the third degree. An enlarged, tender, prolapsed right ovary and a laceration of the cervix were also found. She had two children, aged 6 and 3½ years.

CASE 23.—Miss K., aged 24, struck left knee against seat in getting on a car, but did not fall. She developed marked symptoms of hysteria. There was no possible connection between the injury and a very movable right kidney.

CASE 24.—Miss S., aged 20, was thrown against the door frame in attempting to get out of the car. Her real injury was slight, and she was more frightened than hurt. She gave

a history of repeated attacks of Dietl's crises with vomiting for some years before the accident. They were called "bilious attacks." These attacks continued after the accident and were supposed to be due to an appendicitis produced by the accident. Six months after the accident the appendix was removed but without benefit, as attacks still continued. The sensitive movable right kidney had not been discovered. She had a typical body form.

Case 25.—Mrs. H., aged 36, was thrown from a car while rounding a curve and injured her right knee, which laid her up three months. She said her right kidney was dislocated by a fall from a car six months previously. Examination showed the uterus retroverted, a laceration of the cervix, the right kidney movable to the first degree. No relation existed between the injury and the movable kidney.

Case 26.—Mrs. S., aged 35, in getting off a car was swung around, striking her left side against an upright. She did not fall and did not think she was hurt. Examination showed a lateral curvature of the spine, the characteristic contracted middle zone and the right kidney movable to the third degree; left one movable to the first degree. She complained of numerous symptoms characteristic of neurasthenia. The movable kidney was undoubtedly of long standing.

Case 27.—Mrs. P., aged 32, was shaken up somewhat by the car jumping the track. She said that she did not think at first that she was injured. The next day pains developed in the abdomen and back. Examination showed a heavily loaded colon from constipation. The right kidney was freely movable. There was the typical body form. The real injury here was too slight to have had any effect on the kidney.

Case 28.—Mrs. —, aged 55, fell in getting off a car and struck on her hip and back. She was in bed two months with pain in hip, back and shoulder. The right kidney was movable to the first degree with a positive index; the mobility was evidently of long standing.

CASE 29.—Miss R., aged 26, fell from a car alighting on her feet, then on left side. She was in bed nine weeks with pain in the spine and the hip. She was a frail, slender woman, very constipated, had marked dysmenorrhea and general nervous symptoms. Her right kidney was movable to the second degree.

CASE 30.—Miss A., aged 29, was thrown down while getting on a car and fractured her left humerus at about the center. She has lateral curvature of the spine with slightly deformed chest. Both kidneys were movable, the left worse than the right. There were no symptoms of injury to the kidneys.

CASE 31.—Mrs. D., aged 27, when a car jumped the track, was thrown to the floor, then struck back against car seat. Patient was in bed two and a half months with pain in back, back of head and neck, and left side of the abdomen. She had dysmenorrhea, never had been pregnant. The right kidney was found movable to the second degree. There were no symptoms referable to the kidney.

CASE 32.—Miss R., aged 16, was knocked down by a car and rolled under the fender. She was able to get up and walk to the station after the accident. Her physician said that the uterus was displaced by the accident and he replaced it. At examination the uterus was found in normal position. The right kidney was movable to the second degree and the characteristic body form was present. There were no symptoms of injury to the kidney.

CASE 33.—Miss H., aged 21, was thrown from a bicycle and fractured her left arm near the elbow, bruised her back and leg and was rendered unconscious. She was in bed three weeks. Examination showed a lateral curvature of the spine and a right kidney movable to the first degree, positive index. There were no symptoms referable to the kidney at any time.

CASE 34.—Mrs. R., aged 37, was thrown forward while alighting from a car and cut her left leg. She asserted that exophthalmic goitre resulted from the accident. She has had one child since. Examination showed an old

adenomatous goitre, which she had had for some years. There were no symptoms of the goitre. The right kidney was movable to the second degree. There were no symptoms of injury to the kidney. Typical body form was found.

CASE 35.—Miss W., aged 30, fell down and was struck by a car in the region of the anus. She asserted she was laid up eight months with rectal trouble and during that time was operated on for hemorrhoids. Two months after the operation she had a perirectal abscess. Examination showed a right movable kidney and characteristic body form. The case is very suspicious.

CASE 36.—Mrs. M., aged 41, was thrown to the ground, striking on her right side. She was in bed two weeks on account of a bruise to her right knee, elbow and side of body over the lower ribs. She had had ten children. Her abdomen was loose and pendulous. The right kidney was movable to the second degree; left kidney first degree. She had frequently noticed a swelling or a tumor in her right side, which disappeared again; evidently the right movable kidney and certainly of long standing.

CASE 37.—Miss A., aged 22, received a fright in a collision and claims she was stepped on. Her real injury was slight, but she developed hysterical spells. The right kidney was movable to the first degree.

CASE 38.—Mrs. H., aged 26, in a collision, was thrown from her seat and said that passengers stepped on her. She was able to get up and walk home without difficulty. She miscarried at the third month and was in bed six weeks complaining of nervous symptoms. Double movable kidneys were found, but there were no symptoms of injury to them.

CASE 39.—Miss G., aged 20, jumped from a car and fell. She had a very movable right kidney with Dietl's crises—certainly antedating the injury.

CASE 40.—Mrs. R., aged 38, was struck by a car and knocked down. She miscarried at

the second month. She had had seven children and one miscarriage. She showed on examination very marked visceral ptosis with a movable right kidney, third degree, which was undoubtedly of long standing.

CASE 41.—Mrs. S., aged 37, was struck by a car and knocked down, bruising her right arm. She had six children. Examination showed a very hysterical patient with retroversion of the uterus, a laceration of the perineum and a movable right kidney.

After carefully analyzing these forty-one cases, taking into account the injuries and the manner in which they were produced, the symptoms, the examination of the patients, etc., one is forced to the conclusion that not in a single case is it at all certain, nor even probable, that the kidney was made movable by the accident. It should not be concluded, however, that a kidney already movable may not be injured by violence, as well as one that is normally fixed, or that symptoms connected with a movable kidney may not be aggravated by injury, but the most probable explanation of many of these cases is that the injury but made manifest or called attention to a movable kidney which had existed for some time without giving rise to symptoms or without being recognized. It is a well-known fact that many women have movable kidneys for years without experiencing any special symptoms connected thereto, and that symptoms may appear after a slight injury, as a fall, or after a spell of sickness or unusual fatigue, or even after a nervous shock. I recently had a case illustrating this:

A young married lady of 26 years was hastening to catch a train. She tripped lightly and fell, but did not hurt herself in the least. She caught her train and while making her journey a collision occurred. She received no

physical injury whatever, but was considerably frightened. She was about two months pregnant at the time. A few hours later she had an attack of pain in the right side of the abdomen. During the next year and a half she had several similar attacks at irregular intervals of a few weeks. Examination disclosed a movable right kidney, to which her attacks were undoubtedly due; but it would be ridiculous to say that the collision or fright was in any way responsible for the movable kidney.

From a careful study of the subject, I present the following conclusions:

1. Movable kidneys occur in women with a particular body form, and practically all women with this body form have movable kidneys of greater or less degree.

2. Movable kidney is not produced immediately, but requires time for its development.

3. While it is possible to injure, crush or suddenly displace by violence a normally fixed kidney, such displacement is always accompanied by laceration of the perirenal tissues, which is manifested by distinct local and general symptoms.

4. Severe injuries involving the kidney or perirenal tissues are seldom or never followed by movable kidneys. Sterns says he has not been able to find a single case in the literature where such a result occurred.

5. A movable kidney is never the immediate result of a single trauma.

DISCUSSION.

Dr. James H. Dunn, of Minneapolis, Minn.: I am not prepared to discuss this able paper; it is so exhaustive that it leaves little to be said on the subject. I quite agree with the author that the chief cause of movable kidney lies in the anatomy of the subject, and it is clear that mobility of the kidney is really

caused by injury; at the same time I believe there are a great many things we do not know about movable kidney. We know very well that a kidney may be movable and cause very few symptoms. An important question which arises in connection with these cases is this: How much are the symptoms due to injury? Frequently that is the whole question. What are the symptoms when we have movable kidney? Do the symptoms require intervention, or are there no symptoms, and still there is a movable kidney?

I recall several injury cases where this question has arisen, and I believe the author has admitted that in his paper, but perhaps he has not emphasized it enough. A railway surgeon might draw the conclusion in the case of a person who has a movable kidney and has sustained an injury, that the injury was not the cause of the mobility of the kidney, or not in a large measure. The question is, Has this individual been seriously hurt by this injury? I believe it is held that railroads are responsible if some people are more easily injured than others; it does not relieve them of responsibility. In one case I fixed the kidney for a patient and the patient was known to be well for nearly two years afterward, the kidney remaining fixed. After this she sustained a railway accident, the kidney was loosened and was the cause of serious symptoms which she had not had before. This is a phase of the subject that we need to give more attention to, because I believe it is generally held and admitted by nearly all authorities that a person after an injury may have a movable kidney, yet it is hardly probable that the mobility of the kidney should be produced entirely by the injury. But it does not follow that

the symptoms are not due to the injury, or that the person has not been seriously injured.

Dr. R. Harvey Reed: I congratulate Dr. Harris on his admirable paper. It is a paper of very great practical importance to us as railway surgeons, as well as to surgeons in general. During an experience covering twenty-five years in railway and mine accidents I do not recall a single instance in which there was a movable kidney as the result of an accident, or one that could be traced to an accident, *per se*. During that time I have made, perhaps, in round numbers, about 100 operations for movable kidney, and under no circumstances have I been able to trace movable kidney directly to accident of any kind. It seems to me, judging from my own experience and that of others, movable kidney is rather an uncertain quantity, particularly as regards what really produces it.

It has occurred to me that movable kidney is largely produced on the right side. I think most of you will agree with me on that proposition. Movable kidney is more frequent where there is an elongated liver. You know very well if you open the abdomen that the liver moves up and down with every breath, and if you have an elongated liver and the kidney is attached abnormally high you will have the liver pounding against the kidney until it becomes loose, and after it has once become loose it is an easy matter to dissect up the peritoneum and get to almost any distance down along the line of the muscles of the back. In my observations I have found more kidneys that have become loosened, the result, apparently, of that than anything else, although I am not able to prove this matter. I have found in the majority of these cases the

liver elongated or displaced, if you want to call it the liver that has reached down to the kidney. In the anatomy of the kidney, for about ½ to ¾ of an inch up to as high as 1 inch, it rests upon the twelfth or floating rib, consequently if the liver becomes slightly elongated, displaced or enlarged, the continual pounding on that kidney from the liver going up and down with every breath will have something to do with breaking it loose from its attachments.

Some years ago, before a meeting of this academy, I attempted to demonstrate the fact that a bandage was of no use to a movable kidney, for the reason that we could not bring the bandage to bear upon the movable or floating kidney. It would touch on the ribs or on the side, and touch on the backbone and leave the kidney absolutely free. That, however, is not the point I wish to prove at the present time. I wish to prove that it requires a great deal of pressure from the outside, where we have the heavy muscles of the back, and much pressure in front to affect the kidney. A bandage is not much good in a case of floating kidney. It will not hold the kidney; it may support the abdominal viscera and through that do some good, but the actual bandaging of a patient to support the kidney is of no benefit whatever in my judgment.

I have made operations for various conditions of the kidney, and I must say, without a single exception, so far as I know, there is none that has been produced by traumatism. I agree with the author of the paper that a floating or movable kidney is one which is produced by a gradual process and that it is produced by something that starts to make it loose in the first place. In the majority of

cases, I have no doubt it is done by the liver, and when it is once loose, it floats up and down with the movements of the abdomen in the breathing process, until it dissects up the peritoneum and has a cavity behind it in which it floats up and down freely, and our attention is not called to it until the patient complains. In the first examination you can usually move the kidney from the brim of the pelvis above the ribs without any trouble, showing that the mobility could not have been produced within twenty-four hours or a month, whatever it may be.

Dr. John E. Owens, of Chicago: My experience in railway surgery fully coincides with that of the author of the paper, and the views set forth by him. I have encountered quite a number of cases of movable kidney that have come up for medico-legal adjustment, and in not a single instance have I been able to satisfy myself that traumatism had anything to do with the production of the movable kidney.

I hope Dr. Harris, in closing the discussion, will give us his experience concerning the relation of movable kidney to the liver. I have two cases on which I have operated for movable kidney, in which the patients also had the "corset liver."

Dr. D. S. Fairchild, of Des Moines, Iowa: An important point was made by Dr. Dunn, in relation to the liability of a person having a movable kidney being injured in a certain class of accidents. In very many cases the accidents would not have any influence upon the kidney, whether it was movable or fixed, so far as damaging the kidney itself is concerned. But we know that patients have movable kidneys who suffer no inconvenience or pain in making certain ordinary movements

of the body. If a person should have these ordinary movements exaggerated by an accident ,it is possible that the kidney will suffer a degree of injury that it would not have suffered otherwise. Then, the question arises, to what extent does the movable kidney increase the risks of a person suffering or sustaining an accident, so far as pain is concerned? He has called attention to the fact that oftentimes these pains were mentally suggested by the discovery of the kidney being movable after the accident occurred, and are we to consider them to a considerable extent? Dr. Dunn has also called attention to the fact that a person may have a floating kidney, may have the trouble aggravated or the movements of the kidney increased, the exaggerated movements of the body injuring the kidney by reason of the fact that it moves about freely in the abdominal cavity.

Dr. Harris (closing): I wish to thank the officers and members of the Academy for the invitation to present this subject.

The question as to why one patient will have a movable kidney with symptoms, and another has the same condition with no symptoms, is an interesting one, which I would like to have gone into to some extent, but I did not want to make my paper too long. Some interesting questions have come up in that regard, and a study of the cases shows us many things of interest. It is undoubtedly true that many patients with a high degree of mobility of the kidney will have no symptoms, whereas another patient with a much lower degree of mobility will have innumerable symptoms. It is also a question as to how many of these symptoms which are ascribed to the mobility of the kidney depend upon the mobility itself,

and how many of them depend upon the patient's nervous condition. I have many times operated on patients who presented symptoms which I thought were due to movable kidney, with no relief as the result of the operation, although the kidney remained in place. So I have come to look upon all patients with movable kidney, in whom there is a hysterical tendency, or in whom neurasthenia is present, as unfavorable for operation for movable kidney. They are not the patients who obtain relief from operation. This fact must be considered in estimating the influence of trauma in producing the symptoms. If the symptoms are not due to movable kidney, and because they follow it, there is no reason why they should be associated because the patient may sustain injuries to other parts of the body, as injuries to the nervous system, and symptoms result in that way. The nervous type of movable kidneys constitutes a large majority of the suits for damages we get in railroad cases. I have in my office the records of over 10,000 examinations bearing on these accidents, and I had intended to analyze them if I had time.

With reference to elongated liver, as mentioned by Dr. Reed, I agree with him as to the influence of the liver, but not that the liver is elongated. Strictly speaking, it is not elongated. I have in course of preparation a paper on the influence of the liver in these cases. The liver is compressed by constriction in the mid-zone, and normally we get a liver as a degree of convexity as the result of this constriction. This is apparent if you open the abdomen in these cases of movable kidneys and examine them. We have been operating through the posterior incision, and we have not seen the liver. We have not seen the contents

of the abdomen. (Here Dr. Harris showed by the aid of diagrams how the anterior and posterior edges of the liver are compressed, and pointed out the influence of this in cases of movable kidney.)

I did not exactly say in my paper that the pains were mental. I believe patients have pain come on after an injury in the presence of movable kidneys, but I do not agree that they are all imaginary. I think the pains are real. Many of the pains of which neurasthenics complain are real, although the cause of them is different.

[1]Ann. des. Mal. des. Org. Gen.-urin, 1895.
[2]Deutsch. med. Woch., 1898, xxiv, 508.
[3]The Journal A. M. A., June 1, 1901.
[4]Deutsche Zeitsch. f. Chir., 1891, xxxi, 506.
[5]Deutsche Chir., 67.
[6]Mitteil. aus d. Grenzgebiet., 1898-9, No. 4, 265.
[7]Ueber traumatische Entstehung innerer Krankheiten.
[8]Centralblt. f. Chir., 1903, Beilage 3, No. 36, p. 141.
[9]Arch. f. klin. Chir., 51, 225.

DIET: RELATION OF, IN SURGICAL CASES.

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I am supposed to present some thoughts on the diet question in relation to its surgical bearing here today, but I may be pardoned for referring to the matter in its general relation to life and nutrition as well.

Diet has such an important bearing upon all conditions of life and living that, in my opinion, the subject is worthy of more careful consideration than it usually receives, and I desire to call the attention of the Fellows of the Academy to the results of my own observations and deductions derived from many years of careful study of the subject. I do this with the full knowledge that my views are at varianee with the established theories, and some of the present teaching upon the same subject.

One of the first, among the many grave problems that confront the medical practitioner upon his entrance upon the duties of the medical profession is, how to feed the baby that it may live, may grow, and be free from disease. The question of diet, from that moment forth, throughout all the years of his practice, becomes the one great and all-important problem, always before him, always pressing itself into every "nook and cranny" of his work, always with increasing importance, until

his last case has passed from his hands, and his work has been finished.

It does not matter that he may have been indifferent to its urgent claims for his attention, or that he may have thrust its claims aside as unprofessional, undignified, or unimportant, and that he may have passed on as though he had achieved a victory over it; still its unwelcome presence will be thrust upon him at the very next turn in his work, and so it will continue, no matter what efforts he may make to free himself from its importunities.

The adult animal requires food only for the supply of the waste of the body, on account of the activities of the tissues; while the child, the growing animal, needs a greater proportion of food for the growth of the body, and its harmonious development. It, therefore, follows that the growing animal requires a greater ratio of food than the adult animal, regarding its essential need.

Habit is the body's memory. And, as the habit of eating large quantities of food has become fixed during the period of growth, this fixed habit becomes one of much trouble during the after life of the individual. More food is usually taken than is required for the nutrition of the body, and the excess must be carried away, or eliminated, else it remains in the system as effete, morbid matter, and is a continual menace to the health of the body. But the tendency is, when such excess exists, toward its elimination, and this process follows the same law, that when there is an overflow it seeks the low place, will flow over at that point, will increase the irrigation, and multiply the lesion. In a surgical case such overflow will become a source of trouble, and often defeat the success of an operation of

faultless technic, but which always creates a low place in the vitality of the part.

The stomach being the avenue to the system of whatever may enter it, it also becomes the avenue through wihch disease invades the physical organism; and if septic conditions should prevail, an enormous increase in the septic products will result, so the greatest care needs to be given to the condition of this organ. It is a well known fact that even a tender corn becomes inflamed when the stomach is disordered, that most of the so-called "rheumatic" pains are merely the result of a disordered condition of the stomach; that neuralgia in its varied forms has its source in the disorder of this organ. It has been said that the severe or acute symptoms of an attack of genuine rheumatism are more readily relieved by an absolute fast of six or eight days, and more thoroughly than can be accomplished by medical treatment. Should it be considered strange, therefore, that a disorder of this organ might set up an irritation in the field of a recent operation that would defeat the finest skill of the most competent surgeon? All foods that are not easily and readily appropriated, become irritants and interfere with the harmonious action of the several organs of the body, preventing repair to the injured part.

A surgeon who performs an operation ever so carefully, and does not give attention to the diet of his patient, courts failure, and invites disappointment in his work, while the man who performs an operation in an indifferent manner, with due regard to aseptic conditions, and pays strict attention to the diet and habits of his patient, wins success despite his bungling work and faulty technic.

The diet in a surgical case should be abstemious, simple, nutritious, and easily appropriated by the stomach. We, in the capacity of railway surgeons, deal principally with emergency cases; and, therefore, have no choice as to prior conditions of the stomach of our patients, while a surgeon in private practice can control these elements of success, and prepare his patients properly for the pending operation. When such control can be had, the diet should conform to the strictest idea of simplicity, and consist wholly of liquids or semi-solid substances.

After the operation, in either event, no solid food should be allowed for a sufficient length of time to safely pass the period of any inflammatory reaction; and, keeping in view the fact that more food is usually taken than can be appropriated, even liquids should be given sparingly, and with close discrimination.

When the time arrives that it is deemed safe to allow solid food to be taken, greater vigilance should be had in respect to the character or kind of foods allowed, and all these should be selected with respect to their digestibility and their nutritive value. Some articles of diet are not worth eating because of the large percentage of physical energy required to digest them, and the small percentage of food value. As examples of this class I cite boiled cabbage with pork, or pork alone. It requires from four to four and one-half hours to digest the first, with a food value of about 12 per cent, and a little less time for the latter, with a food value of about 17 per cent; and so they leave a very large residuum. Others of a comparatively low food value are more valuable on account of their

ready digestibility. Tripe, and rice boiled, digest in one hour, and have a fair food value. Their ready digestibility makes them specially valuable. Still others of higher food value are not admissible on account of their indigestiblity. The types of this class are eggs and butter. Butter is practically indigestible in most stomachs. Being quickly converted into butyric acid, it manifests itself as an irritating poison, and becomes a menace to all pacific conditions of the physical body. Furthermore, it is the fruitful source of rheumatism, and not admissible as an addition to any part of the diet in a surgical case. Eggs require from three to three and one-half hours to digest, whether fried, hard or soft-boiled, poached or raw, and are responsible for many troublesome conditions of the kidneys.

Food values vary so much in the different articles of diet, and in their adaptibility in an individual case that a surgeon needs to study carefully each case as to its need, and power to appropriate or digest a given article before it is presented for the use of the patient. There are many articles of diet of comparatively low food value which should be retained on account of their ready digestibility, while there are many articles of high food value that should be regarded with suspicion on account of their difficult appropriation by the stomach. Oatmeal contains about 93 per cent of nitrogenous matter, but is difficult of digestion; beans and lentils with wheat and some vegetables carry a less proportion, but above the average, but are somewhat hard to digest. As a rule, however, the safest diet to use is one composed of fruits, grains, selected vegetables cooked without meat, and the tallow-bearing meats; and the articles to discard

absolutely are alcoholic liquors, butter, eggs, fermented acids, oily substances, pastry, and all articles fried in, roasted, or dressed with butter. Some of the things to be given with caution are pork, chicken, turkey, all fried articles, sweet cake, sugar, and mixed foods. Whole wheat or grain bread should be preferred to white bread. All breads are better toasted; bread toasted is half digested.

This discussion of foods in reference to their digestibility and food values might be carried on indefinitely; but I desire only to add that a healthful diet in general, to aid and enable men and women to attain to their highest capacity mentally and physically, should be simple, nutritious, and consist of such articles as are readily, quickly, and perfectly digested; that it should be mainly of fruits, vegetables simply cooked, and the tallow-bearing meats; that all excesses, and doubtful or harmful articles should be discarded; and that the diet in surgical cases should conform, strictly, to the simplest type of healthful living.

RADICAL CURE OF HERNIA AMONG RAILWAY EMPLOYES.*

BY EDWARD WYLLYS ANDREWS, M. D., OF CHICAGO.

Men who have hernias are rejected for places on fire and police department, as well as army and navy, service, and some civil service appointments. Practice varies in this respect among corporations, but several large railways having well organized medical systems, reject even engineers for hernia. I find not a few applicants who have left one road seek radical cure operations to enable them to pass physical examinations for another. The medical examiners have uniformly admitted these same men after operations, so that I judge that general confidence exists as to the permanency of cure. Examiners for civil and military positions have always done the same thing and even co-operated to the extent of advising the operative treatment and then accepted the candidate. I am informed that soldiers of the regular army acquiring hernias are now required to undergo operation or else forego the privilege of discharge for disability, thus limiting the number of cases which would become applicants for invalid pension.

Hernia is even more important to the railway surgeon because of the great number of acquired cases which appear in adult men. What shall be the attitude of the employer in case this trouble appears? In the great ma-

jority of cases some slight or severe traumatism is alleged, hence hernia comes under the category of personal injury. One of my cases had hernia after he had jumped from his engine from some one's fault. Another was jolted by a collision; another slipped on a defective step, etc. Claims for hernia are fairly numerous and frequently successful. An unpleasant doubt is always left in these cases as to the actual cause or the recent occurrence of the trouble. A man lately came to my hospital service from the Michigan Central railway, having purposely kept away from his own surgeon. He declined operation and I soon found that his sole purpose in being examined was to get medical testimony as to his hernia, which he said had resulted from a recent injury. Partly by accident it was discovered that he had really had the trouble a long time and had used it to collect damages from another company. It was small and only to be found at times, hence easily overlooked in examinations for admissions. He has been arrested and is now under criminal indictment.

The real problem comes in the case of acquired hernia in faithful employes. Probably if it were insisted on most of these men would undergo operation, and nearly all of them would welcome the chance of relief if the railway bore the expense of loss of time. I say this because cured cases act as missionaries and large numbers of cured individuals are now found in many localities. From the B. & O. road near Garret, Indiana, a score or more of such cases have been sent to me for some reason and now I find that they send each other and some outsiders not employes living near there. If, on the other hand, there are dangers or drawbacks of any kind, the respon-

sibility of requiring operation would be too great for any corporation to take. If deaths occur, or any great number of relapses, or if any patients are made worse instead of better, the companies would be very chary of meddling in such a matter. This would certainly have been the case fifteen or twenty years ago, but it is not the case now. No mortality except from anesthetics, and practically no relapses may be truthfully claimed today in radical-cure work. The danger of operation stands as a distinctly smaller one than that of the strangulation risks of a life-time.

We have had with my method (called the imbrication operation), something over 1,000 reported cases—a little more than half of this number in my own service. No deaths have occurred in my cases and although the records are not accessible in all, a very small percentage of recurrences has taken place in the ones we have kept track of.

THE TUNING FORK AS A HEARING TEST.

BY ALBERT H. ANDREWS, M. D., OF CHICAGO.
Oculist and Aurist, Rock Island System. Professor of Otology, Post Graduate Medical School, etc.

That the watch test for hearing gives unsatisfactory and unreliable results is generally admitted. It has fallen to the lot of all examiners to find men who had no apparent loss of hearing for practical purposes still unable to hear the watch more than a few inches from the ear. To discharge a man from service, or even to reject his application simply because he can not hear a watch the required distance, is an injustice to the man and unnecessarily deprives the employer of valuable services.

The whisper test is undoubtedly the best now in general use, but this test is subject to so many variations that it is not, and never will be a correct index to the hearing ability. Outside noises, the shape of the room, the character of the whisper, all influence the result.

The examiner of experience may be able to estimate these influences and report the man fit or unfit for service according to his judgment but he can not make a report that will give the employer any definite idea of the man's actual hearing ability. When the hearing is fully up to the requirements of the watch and whisper tests no further examination seems necessary, but [illegible] on the watch test and the [illegible]

certain, then it would be desirable to have an additional test which can be relied upon to give accurate and uniform results, and which will give a third party definite information regarding the man's hearing ability.

The ideal test should have certain characteristics:

1. It should give the same results in the hands of all examiners.

2. It should be simple, easy of application and require little time.

3. It should be easy to detect misstatements.

4. It should require little and inexpensive apparatus.

5. It should be influenced as little as possible by outside noises.

6. Especially in the re-examination of employe it should give something more definite than the examiner's judgment as to fitness for service.

No test has yet been devised which can satisfactorily answer all these requirements, but probably the tuning-fork test more nearly approaches the ideal than any other. This is made by striking the fork sufficiently hard to give it its full initial vibration, then holding the fork close to the ear, have the person being examined indicate the moment when he can no longer hear the sound. The hearing ability is represented by a fraction, the numerator of which shows the number of seconds the fork is heard, while the denominator shows the number of seconds the normal ear should hear this particular fork. Whether the fork was struck hard or lightly might be expected to influence the time which it can be heard, but the facts are that every fork has its full initial vibration which is brought out by a

very moderate blow, and no matter how much harder the fork is struck it will not vibrate enough longer to be of any consequence.

A fork should be selected giving about 256 double vibrations per second. Frequently a higher fork is recommended but the lower tone is more nearly the pitch of the sounds the employe will be expected to hear. Forks of the same pitch vary greatly in the length of time they can be heard.

Among my collection is one that can be heard only ten seconds, while another of the same pitch can be heard over two minutes. A fork which can be heard thirty to forty seconds will be found most satisfactory. If a longer time fork is used too much time will be consumed in making the test.

Before any fork is used as a test the time which a normal ear can hear it should be determined. This is done by testing a considerable number of apparently normal ears and taking the average time as the standard. Time should be counted from the striking of the fork and not from when it is held from the ear. Misstatements are detected by making repeated tests and sometimes stopping the vibrations with the finger or removing the fork from the ear without the applicant's knowledge. If he is pretending he will not promptly indicate that the sound is gone when the fork is removed or its vibrations are checked.

Care should be taken to hold the fork in the same relative position both in establishing the standard of the fork and in making subsequent examinations. Probably the best position is directly opposite the auditory meatus and as close to the ear as it can be held without danger of touching. Outside noises are found

to affect this test much less than either the whisper or the watch test. This may be accounted for by the fact that it is a time test instead of a distance test, and the close proximity of the fork to the ear prevents interference. In order to insure the greatest accuracy, however, the same general conditions should surround the examinations as were present when the tests were made to establish the standard of the fork.

One of the objections to this test is the time required to conduct it. If it is only used as an additional test in cases of doubt, the advantages to be obtained are certainly worth a few minutes' extra time. Another objection is the care and time required to detect misstatements. If it is explained to the applicant that the examiner intends to stop the fork and that if he does not report immediately when he fails to hear it, it will count against him, little difficulty will be found along this line.

The amount of hearing necessary for the acceptance of applicants ought, in the judgment of the writer, to be at least 80 per cent, with a certain amount of leniency in the reexamination of old and experienced employes.

EXHIBITION OF KNIFE WITH A SPECIAL CURVE.

BY E. O'N. KANE, M. D., OF KANE, PA.

This knife is of medium size, has a rounded cutting point and short oval blade and shank long, narrow and almost round. The back of the blade also cuts, but is of shorter length and has a sharp heel.

This knife enables the operator to cut to great depth without having to enlarge the skin opening, it being only necessary to bring the handle from the horizontal to the vertical as the depth increases. One can thus perform a laparotomy through a much smaller opening than would otherwise be necessary. As the cutting surface is short, there is no danger of rewounding the divided tissue above the immediate operative field, and the long, narrow, rounded shank neither bruises nor obstructs the view. The cutting surface of the back enables the operator to cut backwards without having to turn his knife, and the sharp heel makes it easy to clear the wound angles from within out without it being necessary to incline the knife.

This knife will be found especially valuable in all work at great depth in a confined area, as in the disarticulating of

the hip joint; the ligation of deeply-seated vessels; in appendectomies and other abdominal work, particularly upon stout subjects, when it is desired to make a small opening; in vaginal hysterectomies, perineal lithotomies and in work upon the cervix uteri. It is not a good blade for ordinary amputation, having too short a cutting surface, but as conservative surgery has made amputation out of fashion this is no great drawback.

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